

McIntosh

MX 113

AM / FM TUNER PREAMP



SERVICE INFORMATION

STARTING WITH SERIAL NO. 100H1

McINTOSH LABORATORY INC. 2 CHAMBERS STREET BINGHAMTON, NEW YORK

MX 113

ELECTRICAL SPECIFICATIONSAM TUNER SECTION**SENSITIVITY**75 μ V IHF (external ant.)**SELECTIVITY, ADJACENT CHANNEL**35 dB minimum IHF in "NORMAL" Position.
45 dB minimum IHF in "NARROW" Position.**SIGNAL TO NOISE RATIO**

45 dB IHF minimum; 55 dB at 100% modulation.

IMAGE REJECTION

65 dB minimum 540 kHz - 1600 kHz.

HARMONIC DISTORTION

Does not exceed 1% at 30% modulation.

FREQUENCY RESPONSE3.5 kHz - 6 dB, "NORMAL" Position.
2.1 kHz - 6 dB, "NARROW" Position.FM TUNER SECTION**USEABLE SENSITIVITY**2.5 microvolts at 100% modulation (± 75 kHz deviation) for 3% total noise and harmonic distortion IHF.**SELECTIVITY**ADJACENT CHANNEL:
6 dB minimum IHF in "NORMAL" Position.
15 dB minimum IHF in "NARROW" Position.**SIGNAL TO NOISE RATIO**

70 dB below 100% modulation.

ALTERNATE CHANNEL:58 dB minimum IHF in "NORMAL" Position.
88 dB minimum IHF in "NARROW" Position.**CAPTURE RATIO**

1.5 dB

SPURIOUS REJECTION

90 dB IHF minimum.

HARMONIC DISTORTIONMono: Does not exceed 0.3% at 100% modulation ± 75 kHz deviation.**IMAGE REJECTION**

95 dB minimum, 88 MHz - 108 MHz.

Stereo: Does not exceed 0.5%

STEREO SEPARATION

35 dB at 1,000 Hz.

AUDIO FREQUENCY RESPONSE ± 1 dB 20 Hz to 15,000 Hz with standard de-emphasis (75 μ sec.) and 19,000 Hz pilot filter.**SCA FILTER**50 dB rejection from 67 kHz to 74 kHz.
275 dB per octave slope.**FREQUENCY RESPONSE** ± 0.5 dB, 20 Hz to 20,000 Hz.**OUTPUT (tape)**

0.25 volts with rated input. Phono input signal of 10 millivolts produces 1.2 volts output. FM and AM will produce 1.2 volts output at 100% modulation.

DISTORTION

Less than 0.1% at 2.5 volts 20Hz to 20 kHz.

OUTPUT (center channel)

2 volts with rated input to both channels.

2 millivolts for 2.5 volts output at 1 kHz.

BASS CONTROL

-18 dB to +16 dB at 20 Hz.

INPUT SENSITIVITY (phono 1 and phono 2)**TREBLE CONTROL** ± 20 dB to 20,000 Hz.

0.25 volts for 2.5 volts output.

LF FILTER

Flat or roll off below 50 Hz, down 12 dB at 20 Hz.

HUM AND NOISE (phono 1 and phono 2)**HF FILTER**

72 dB below 10 millivolt input.

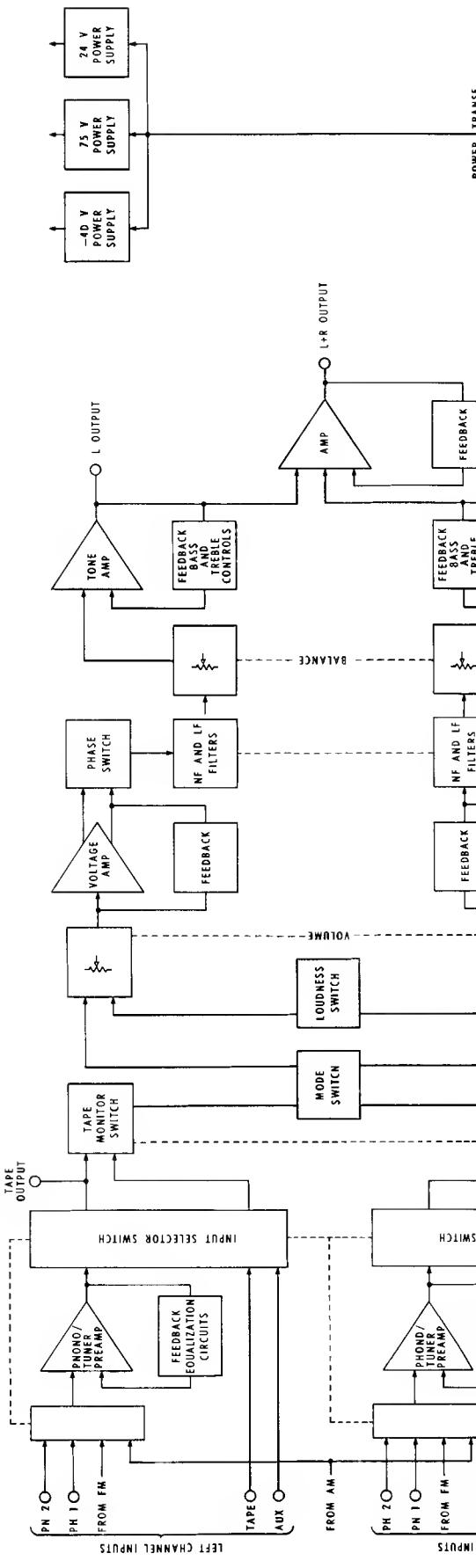
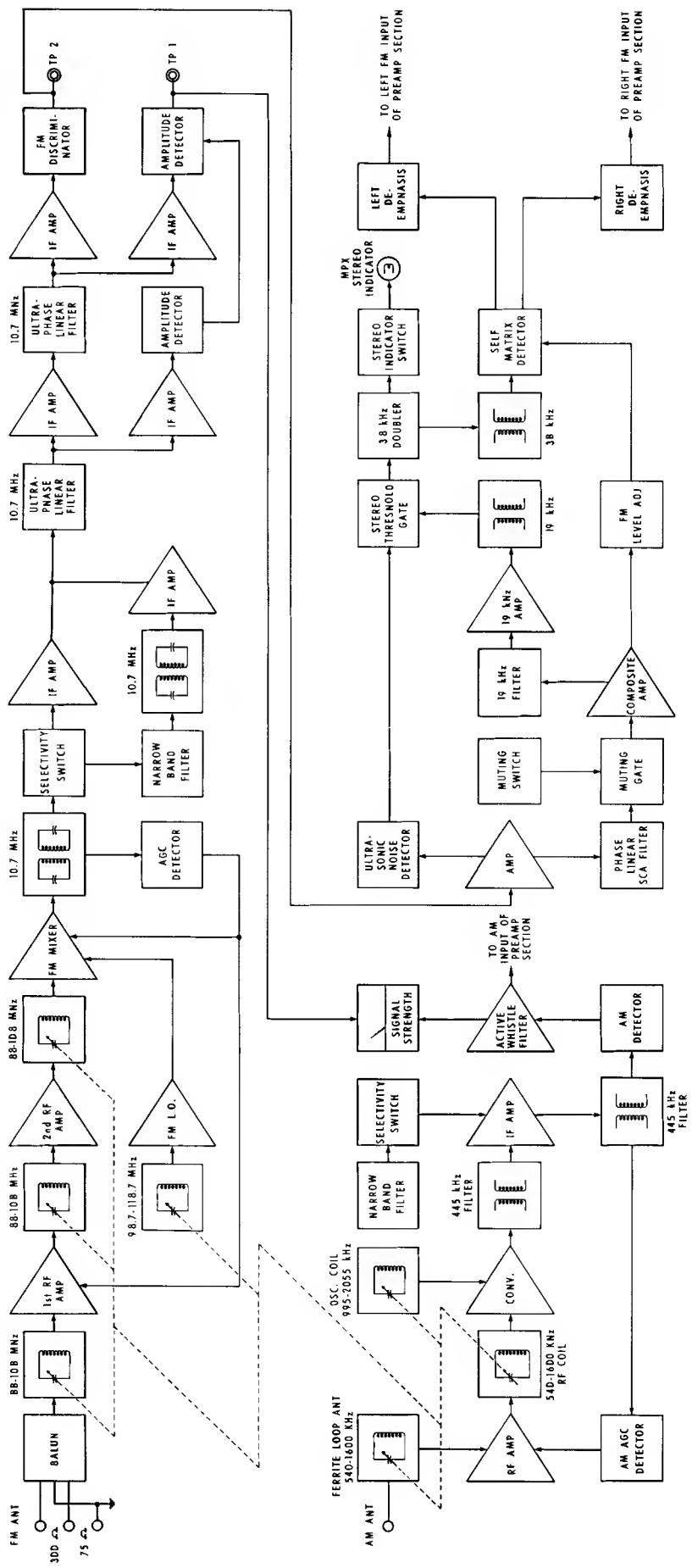
Flat or roll off above 5000 Hz, down 12 dB at 20,000 Hz.

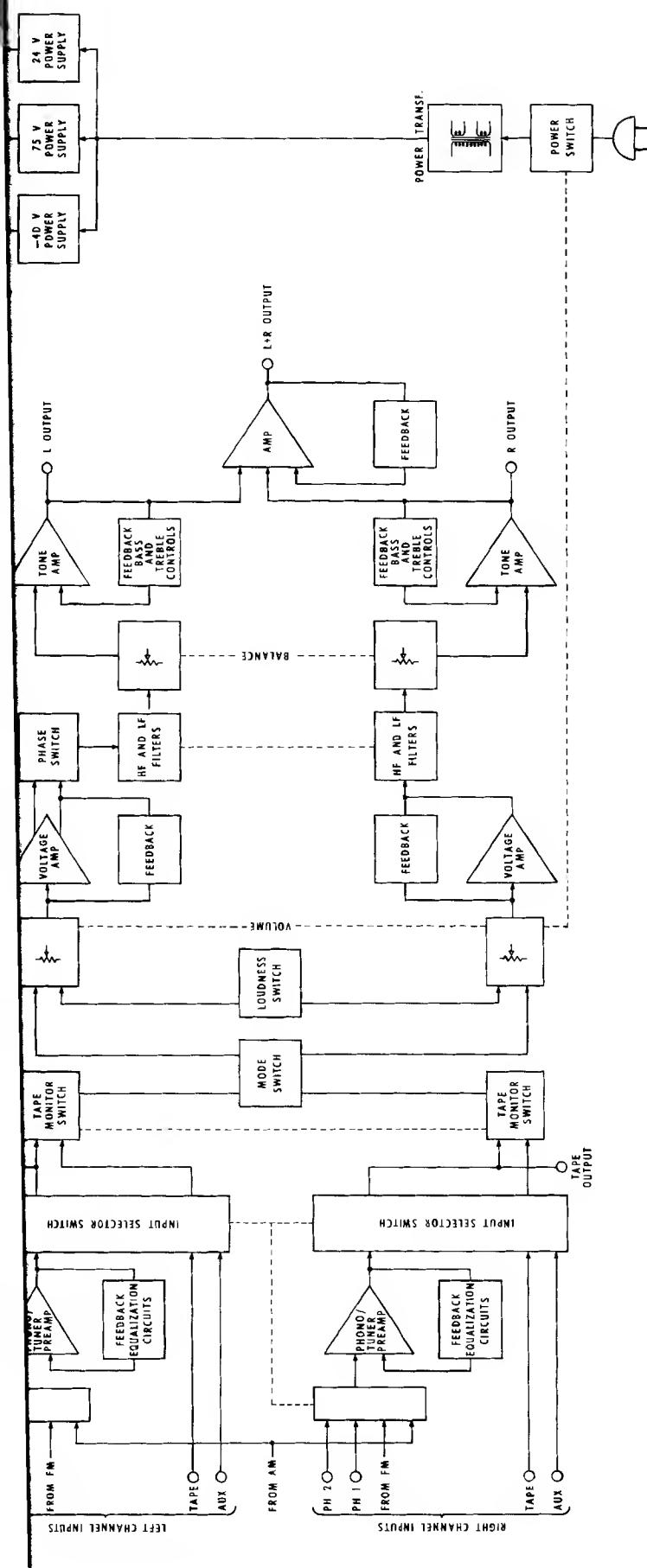
HUM AND NOISE (aux, tape)

85 dB below rated output.

OUTPUT (main)

2.5 volts with rated input. Up to 10 volts can be developed without distortion. FM and AM will produce up to 10 volts output at 100% modulation.



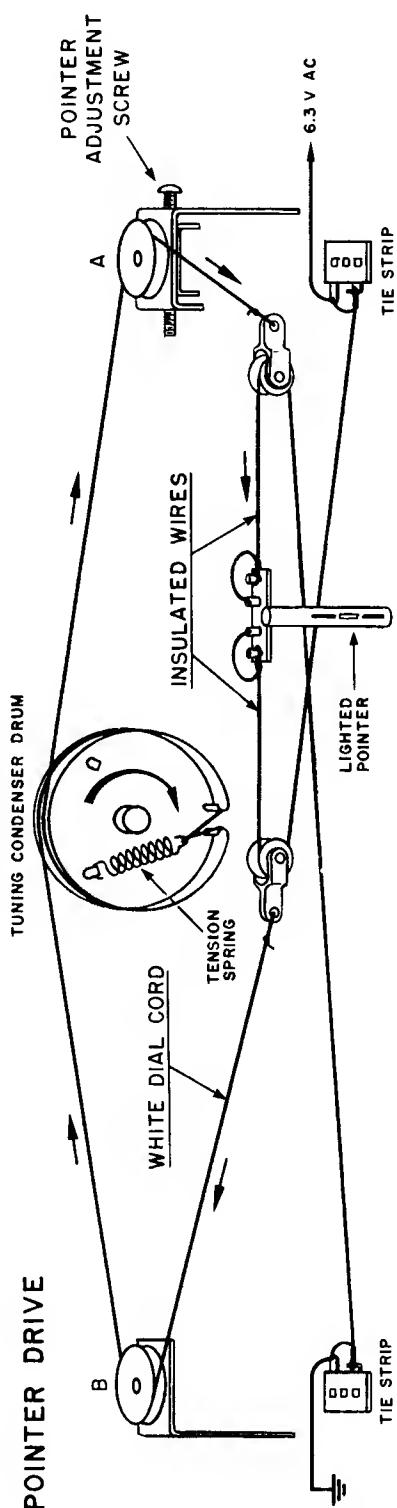


MX 113 BLOCK DIAGRAM

SCHEMATIC NOTES

1. Unless otherwise specified: Resistance values are in ohms, 1/4 watt, and 10% tolerance; capacitance values smaller than 1 are in microfarads (μF); capacitance values greater than 1 are in picofarads (pF); inductors are in microhenries (μH).
2. Printed circuit board components are outlined on the schematics by dotted lines. The circled numbers around the dotted lines correspond to the numbers on the PC Board layouts.
3. The heavy lines on the schematics denote the primary signal path.
4. The terminal numbering of rotary switches is for reference only.
5. All voltages indicated on the schematics are measured under the following conditions:
 - a. Use of an 11 megohm input impedance VTVM.
 - b. All voltages $\pm 10\%$ with respect to chassis ground.
 - c. No signal at input or antenna terminals.
 - d. AC input at 120 volts, 50/60 Hz.
 - e. Front panel controls at:

Tuning indicator	100 MHz (no signal)
Volume	Fully CCW
Mode	Stereo
Muting	Out
Input Selector	AM (to measure AM section) FM (to measure FM section)
Panel Lights	Bright
Selectivity	Out
 - f. Voltages shown in rectangles are measured with selectivity switch in the "In" position.
6. In units with serial no.'s below 187H5 R219 and R225 are used.
7. In units with serial no.'s below 190H0 R329 and R330 are 15K; C8 is 12pF R528 is used; D505 and D506 are not used and R530 is connected as shown by dotted line.
8. In units with serial no.'s below 178H9 C38 is 3pF; C527 and C528 are not used and dial glass is McIntosh part no. 044-359.
9. In units with serial no.'s below 189H4 C505 is .02 μF .
10. In units with serial no.'s from 175H0 to 190H0 C527 and D504 are used.
11. In units with serial no.'s below 199H9 C124 is used and C402 is 100pF.
12. In units with serial no.'s from 167H5 to 178H8 C101 and C108 is not used.
13. In units with serial no.'s below 182H5 R408 is 680 Ω ; R411 is 10K; R412 and R418 are used.
14. In units with serial no.'s from 238H2 to 282H6 C213 is used. In units with serial no.'s below 282H6 R203 is used and L201 is not used.
15. In units with serial no.'s below 322H6 R337 and R338 is 1.8k.
16. In units with serial no.'s below 269H6 the MPX Lamp is a #1828 bulb and R419 is used.
17. In units with serial no.'s below 262H1 C214 is not used.
18. In units with serial no.'s below 400H1: R399 and R400 are 1M; C303, C304, C313 & C314 are used; C346, C347, C348, C349, C350, C351, R399-2 and R399-3 are not used and C415 is .22 μF .
19. In units with serial no.'s below 282H6: C413 is .1 μF ; R415 and R416 are used; Q407 is not used and D407 is connected as shown by dotted lines.
20. In units with serial no.'s below 334H9 R530 is 7.5k and D505 is McIntosh Part No. 070047.
21. In early units R526 is not used.
22. In early units C10 and C35 are .001 μF .

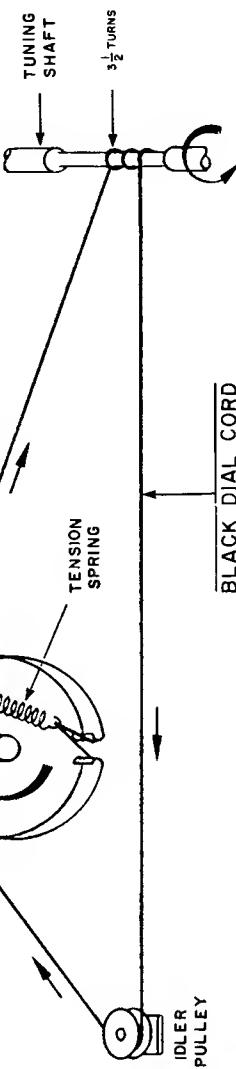
**PART I
POINTER DRIVE**

- Step 1** Before stringing unit, turn pointer adjustment screw until pulley "A" is in the center of its travel.
- Step 2** String unit as shown.

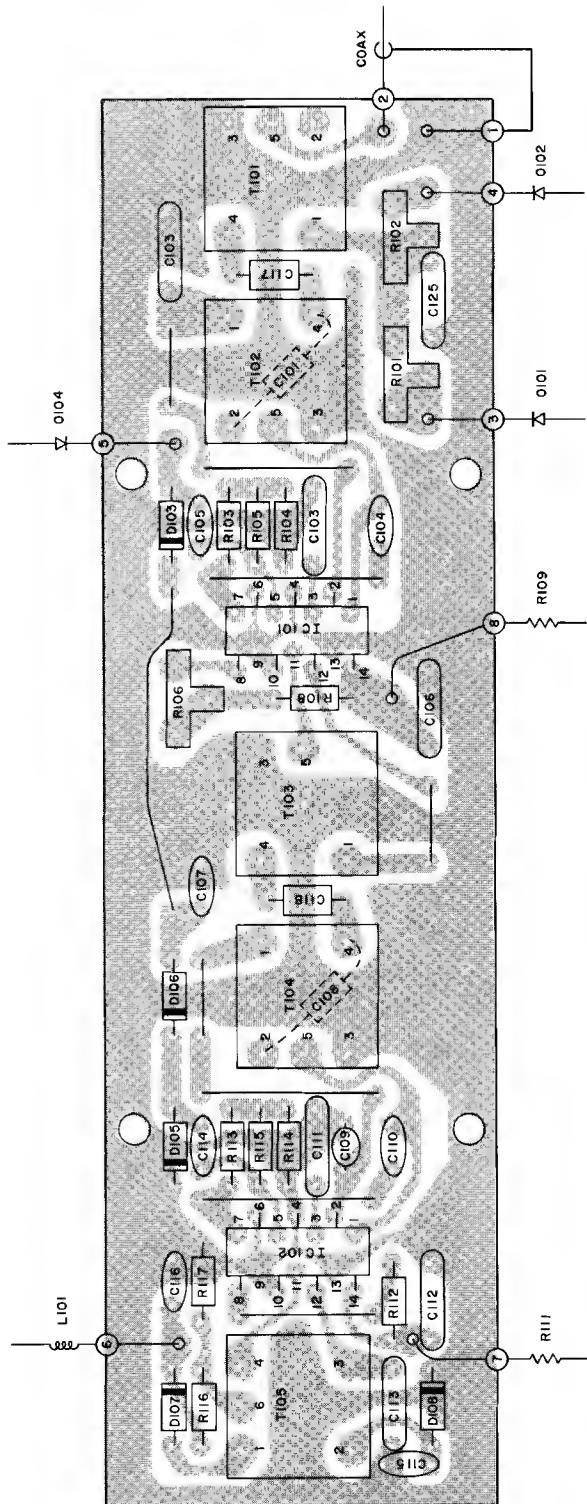
- Step 3** After stringing unit, turn tuning shaft until pointer is as far to the left as it will go. Turn the pointer adjustment screw until the pointer coincides with the zero bar of the logging scale.

- Step 4** Turn the tuning knob making the pointer move back and forth from one end of the dial scale to the other. Return pointer to the far left and, if necessary, re-adjust pointer position.

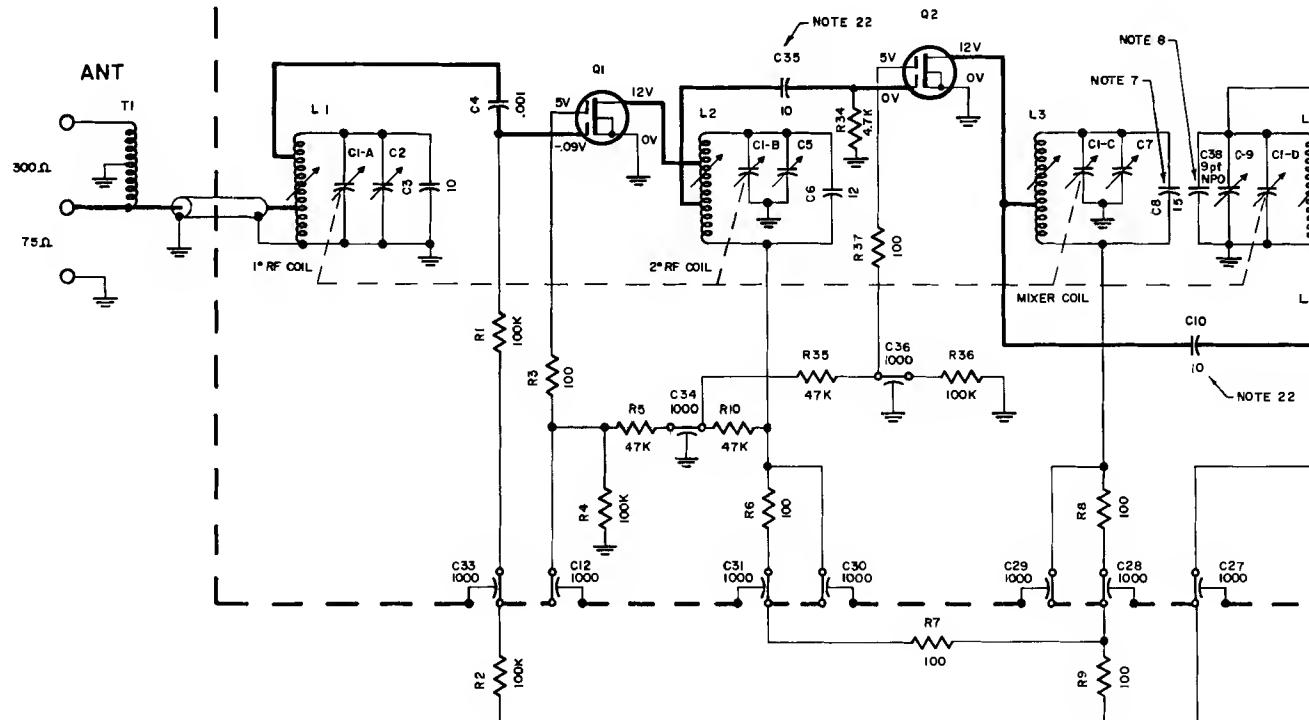
(TO LEFT SIDE PULLEY B) WHITE
(TO IDLER PULLEY AND TUNING SHAFT) BLACK

**TUNING CONDENSER DRIVE****DIAL CORD SEQUENCE****POINTER DIAL STRINGING**

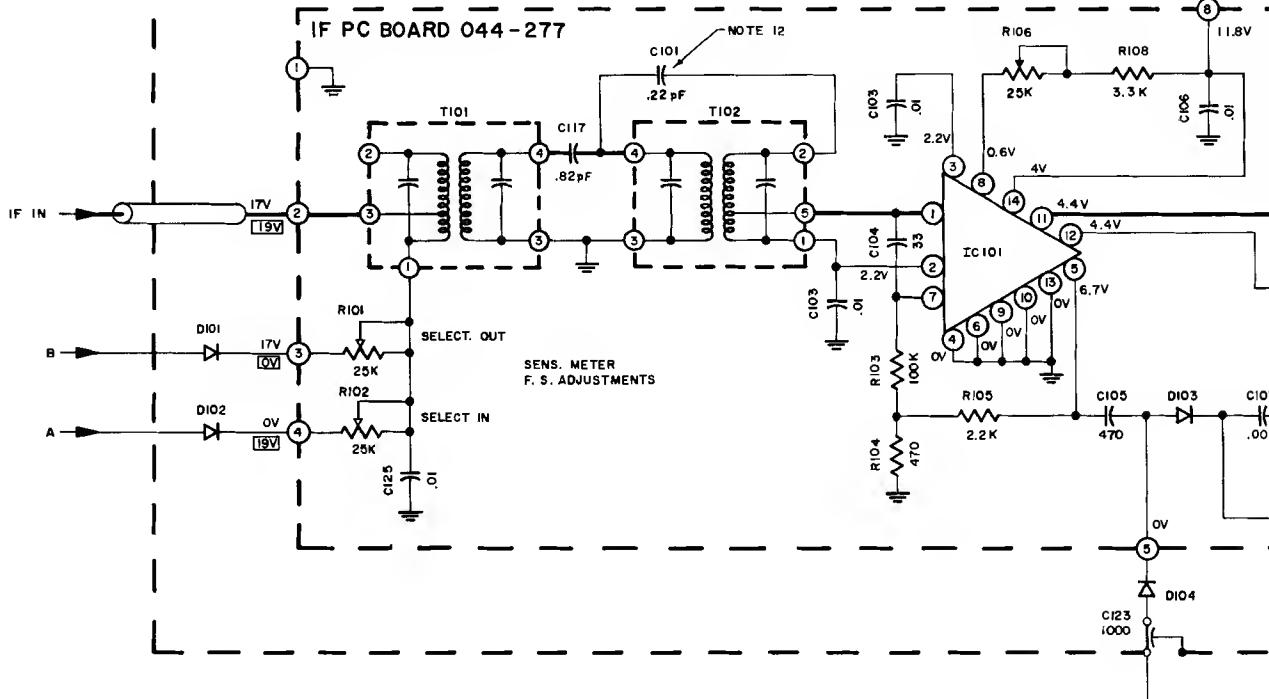
IF PC BOARD 044-277

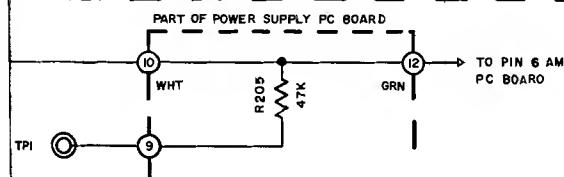
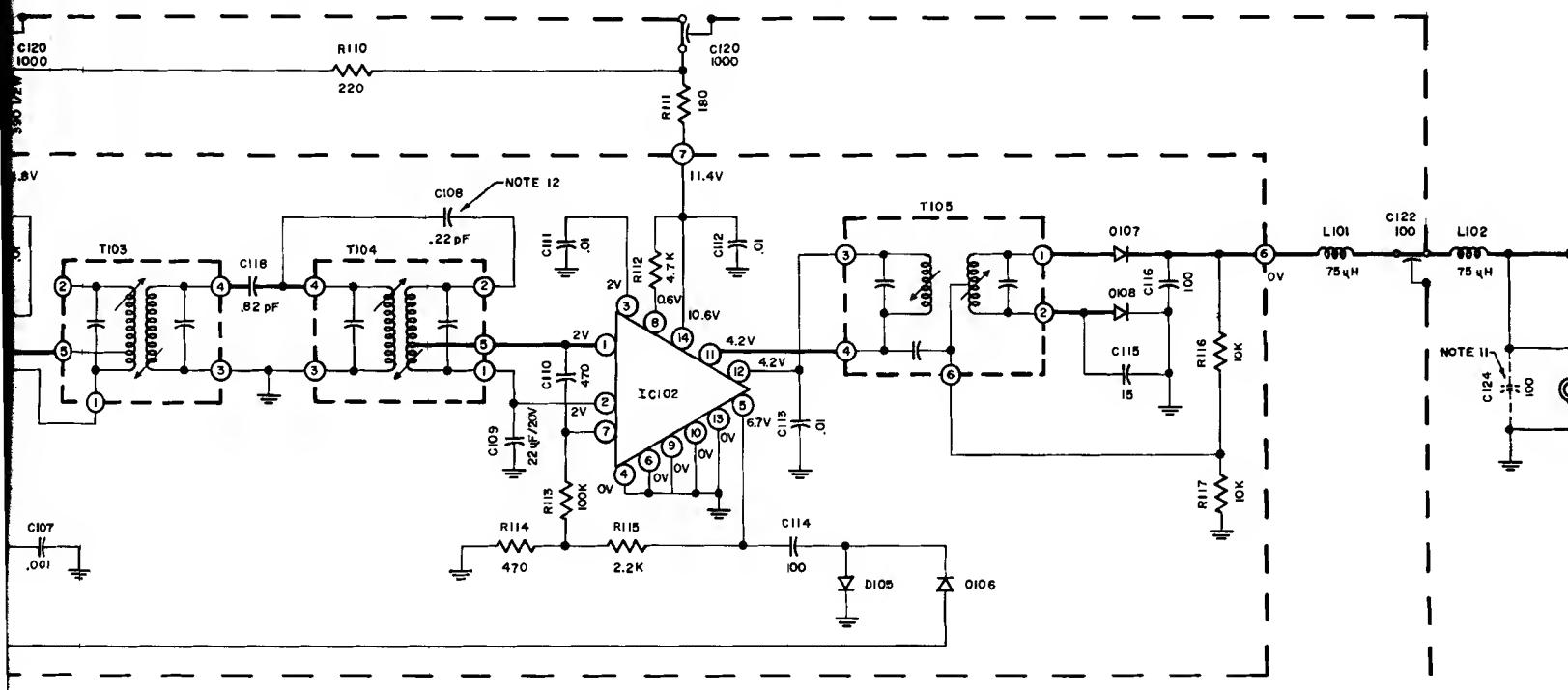
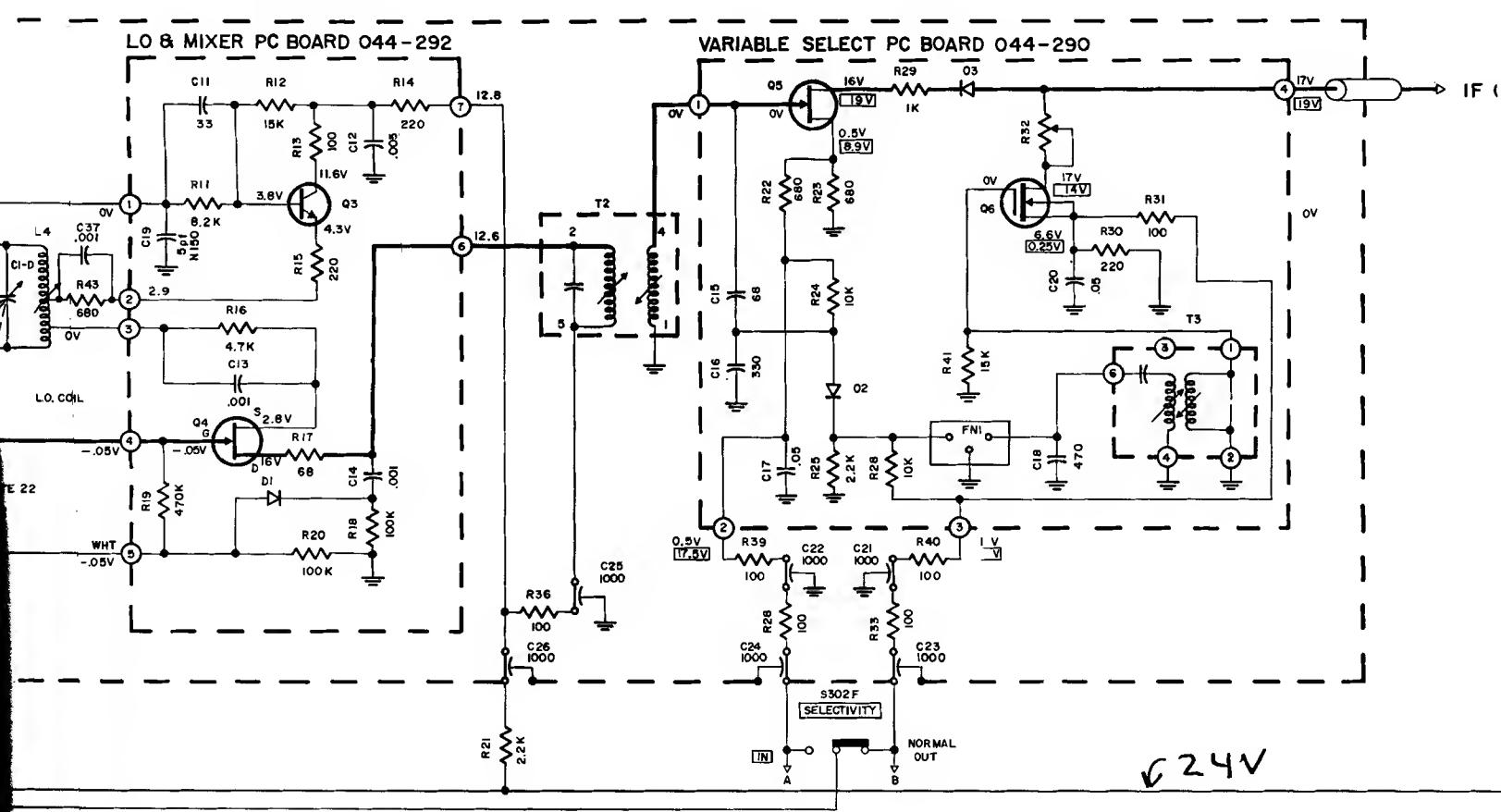


RF CHASSIS



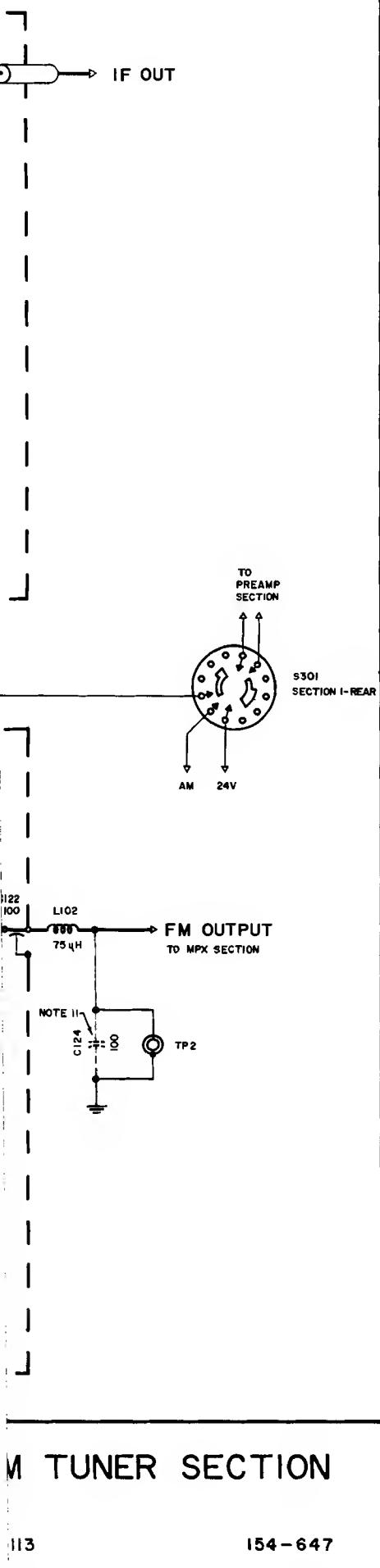
IF CHASSIS



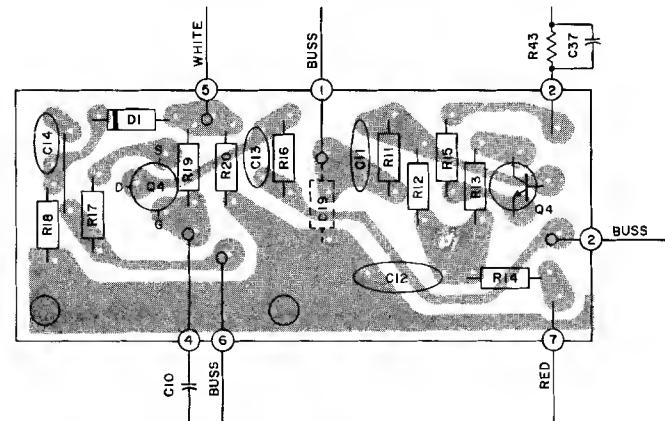
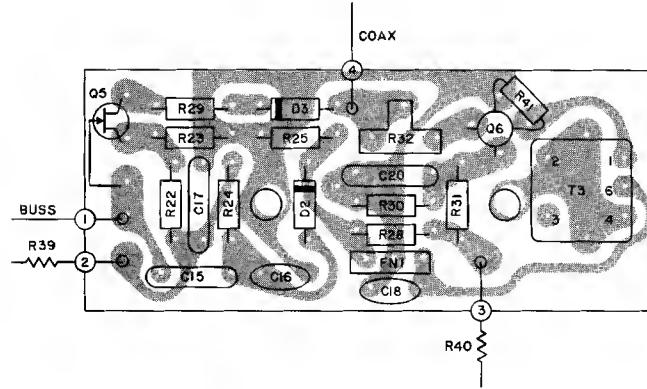


FM TUNER

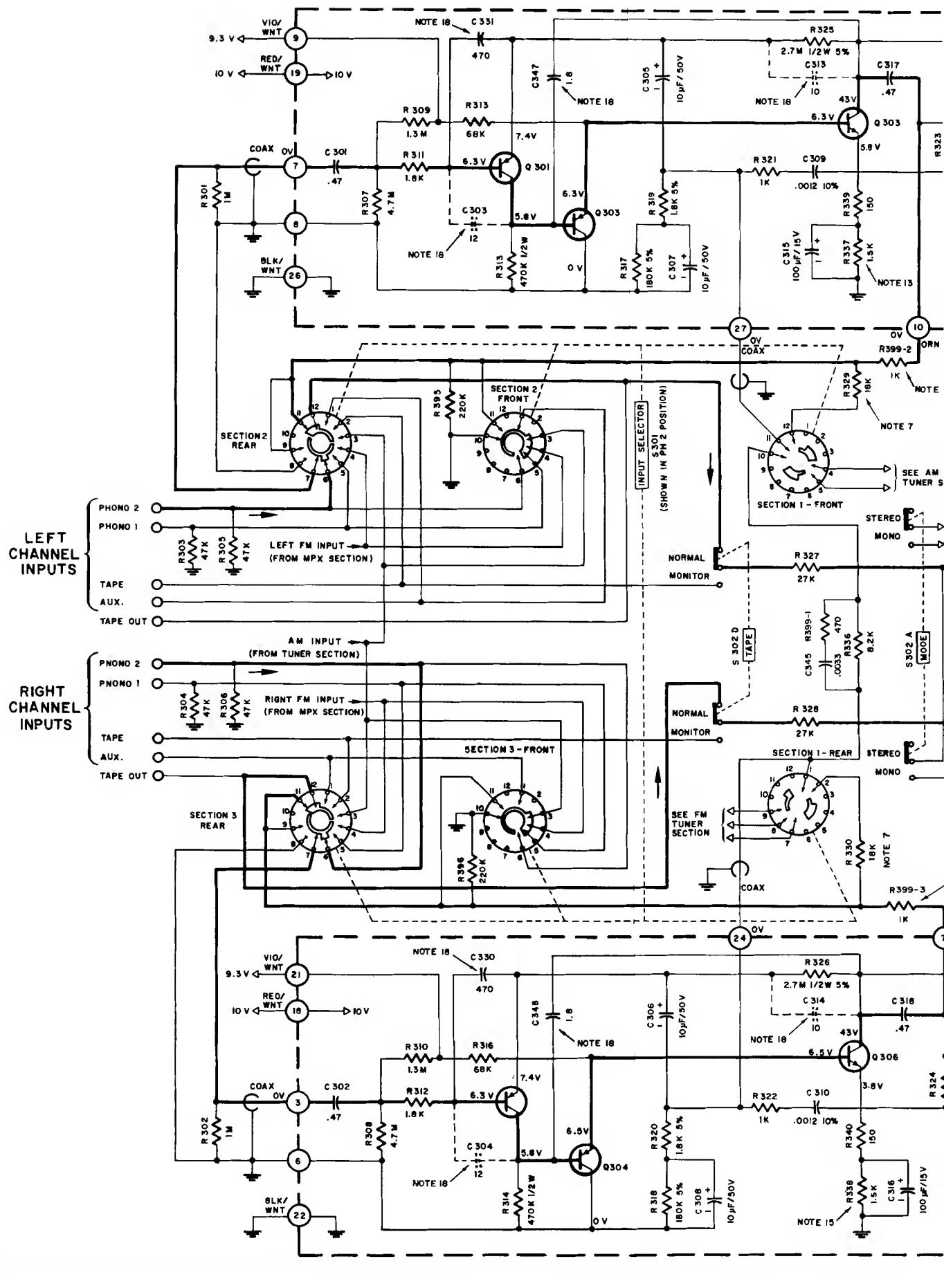
MX 113



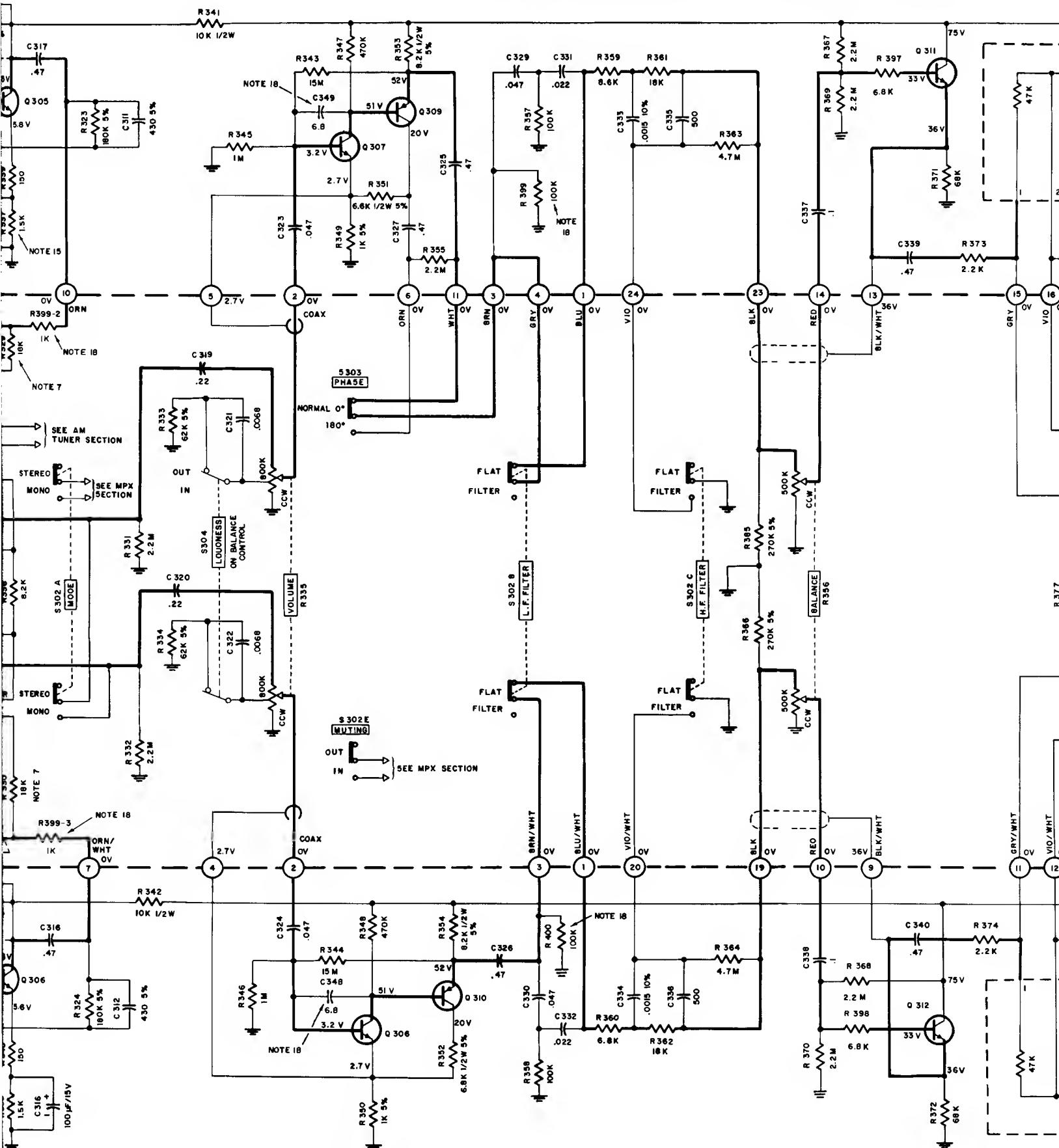
SELECTIVITY PC BOARD 044-290



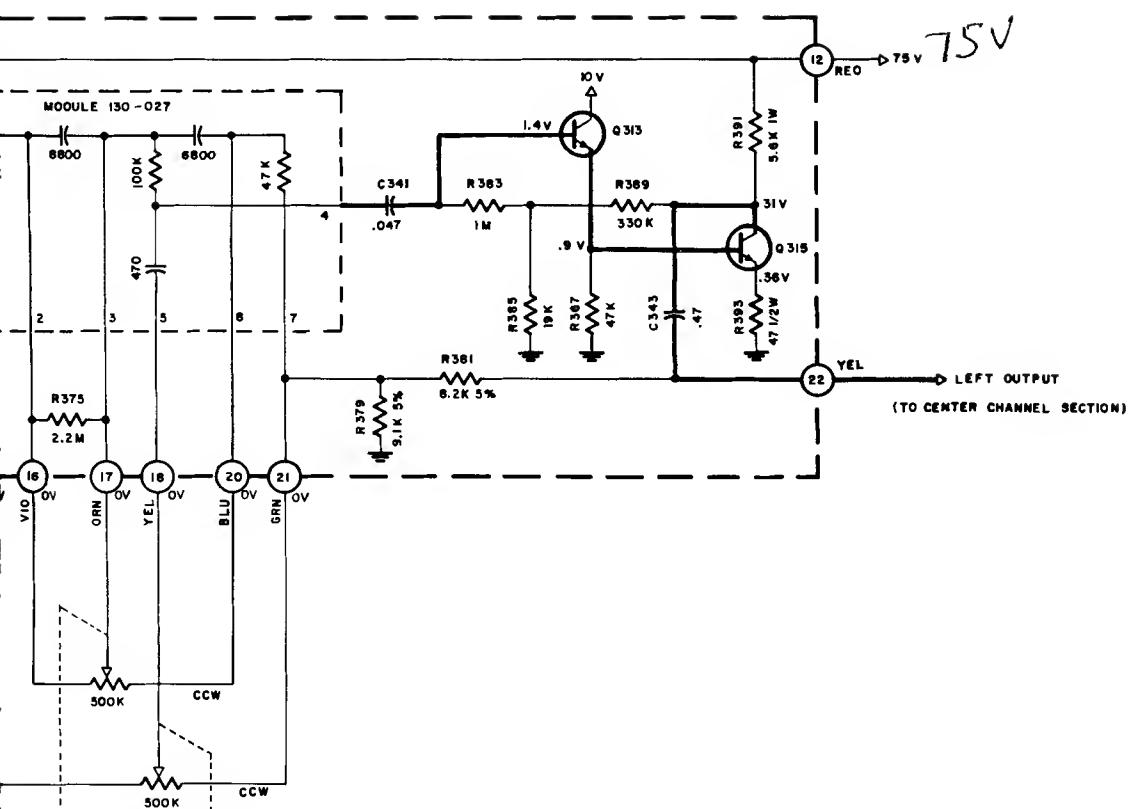
MIXER & LOCAL OSCILLATOR PC BOARD 044-292



LEFT CHANNEL PREAMP. PRINTED CIRCUIT BOARD 044-554

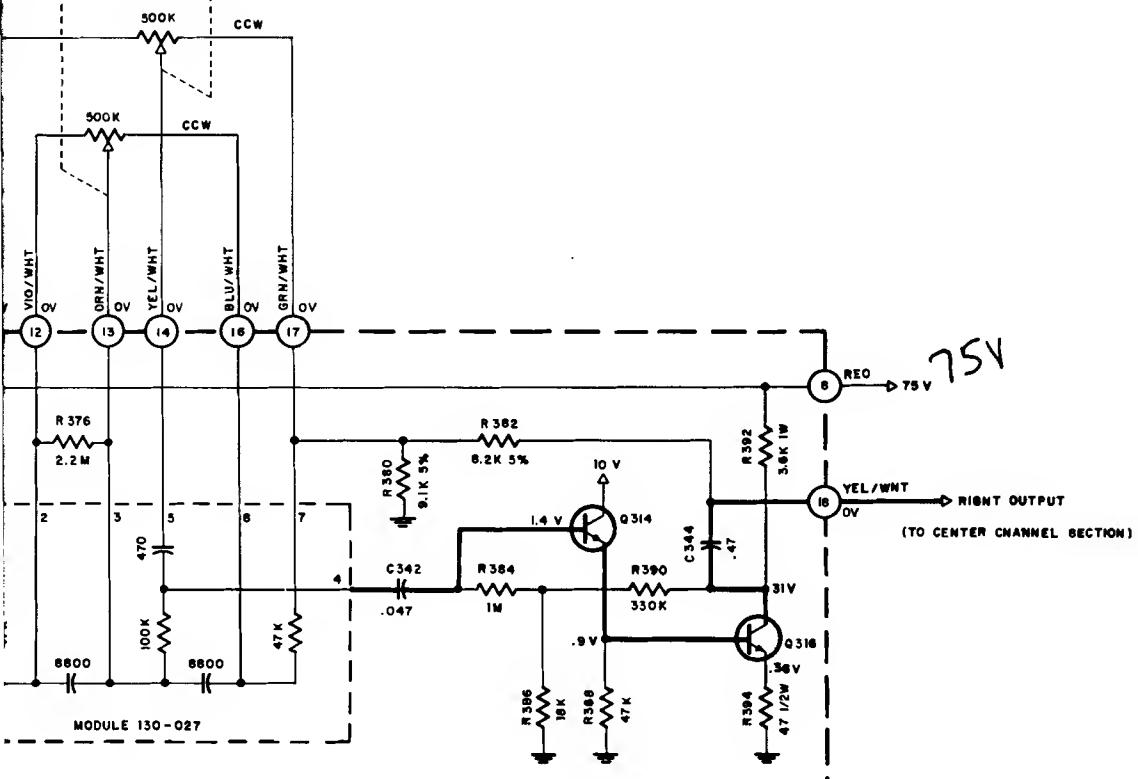


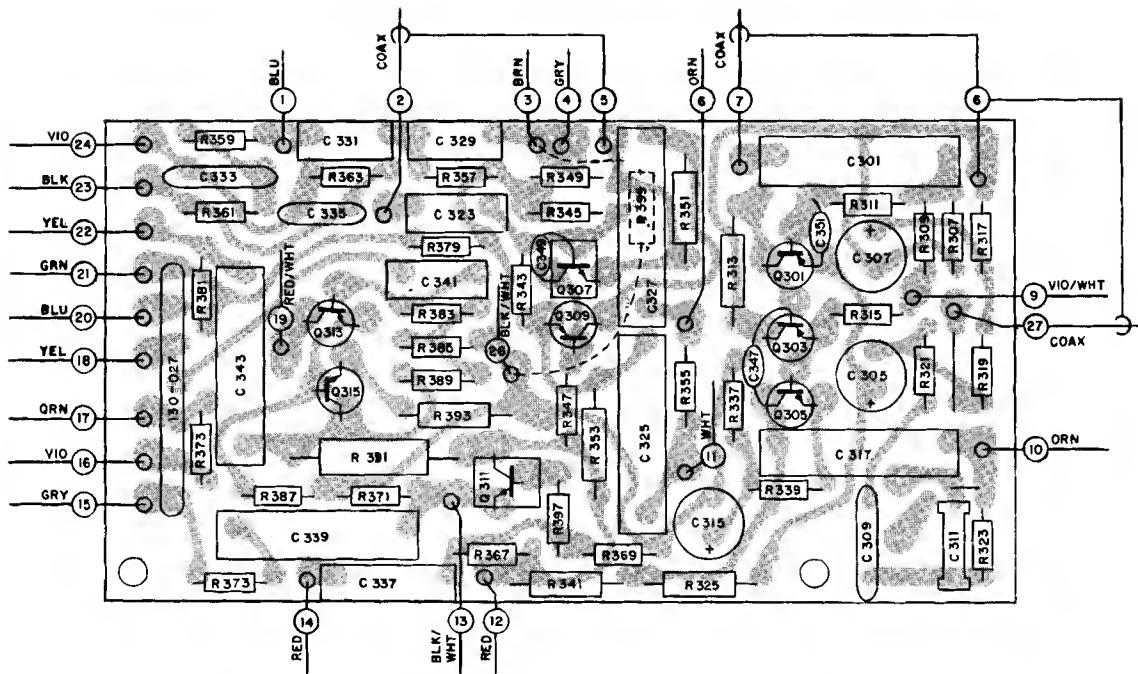
RIGHT CHANNEL PREAMP. PRINTED CIRCUIT BOARD 044-554



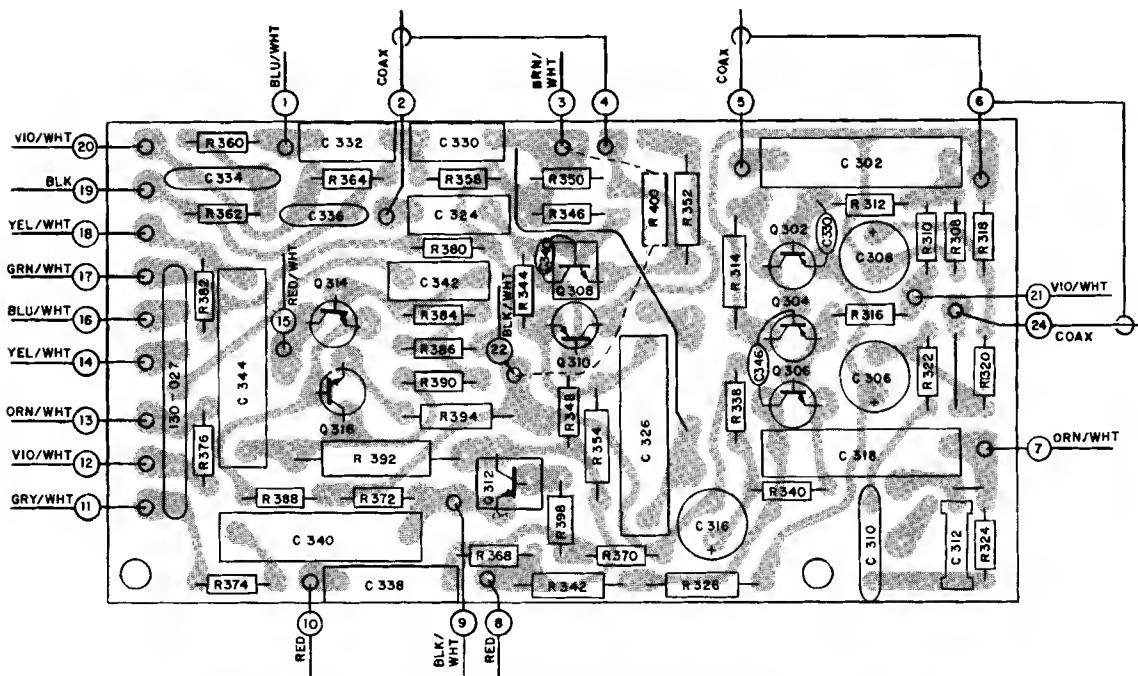
PREAMP. SECTION

MXII3 154-648

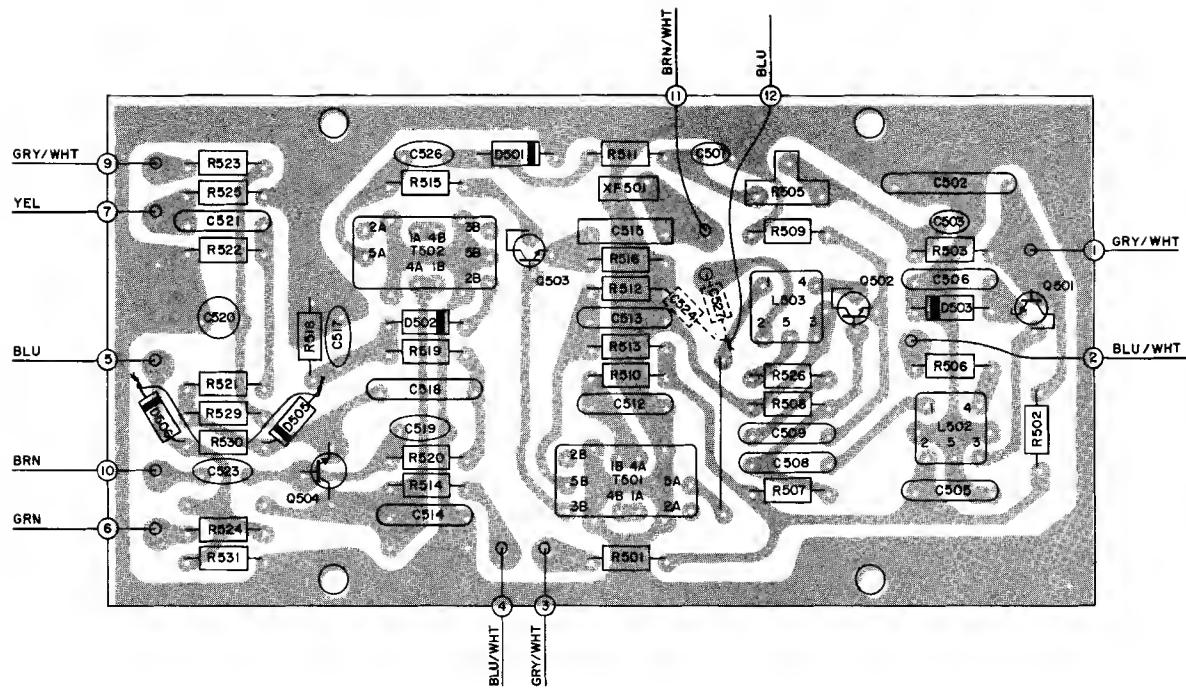




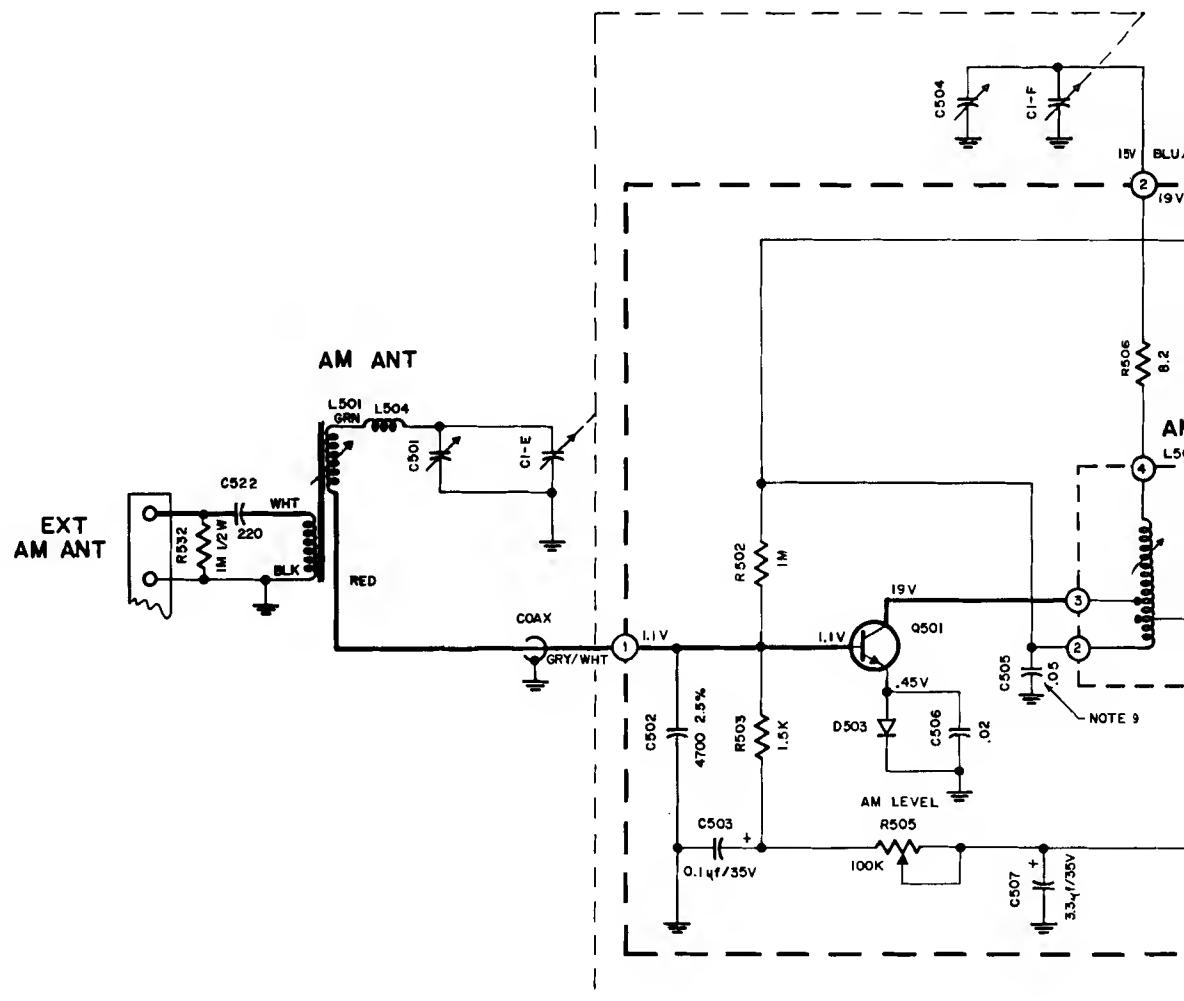
LEFT CHANNEL PREAMP PRINTED CIRCUIT BOARD 044-554

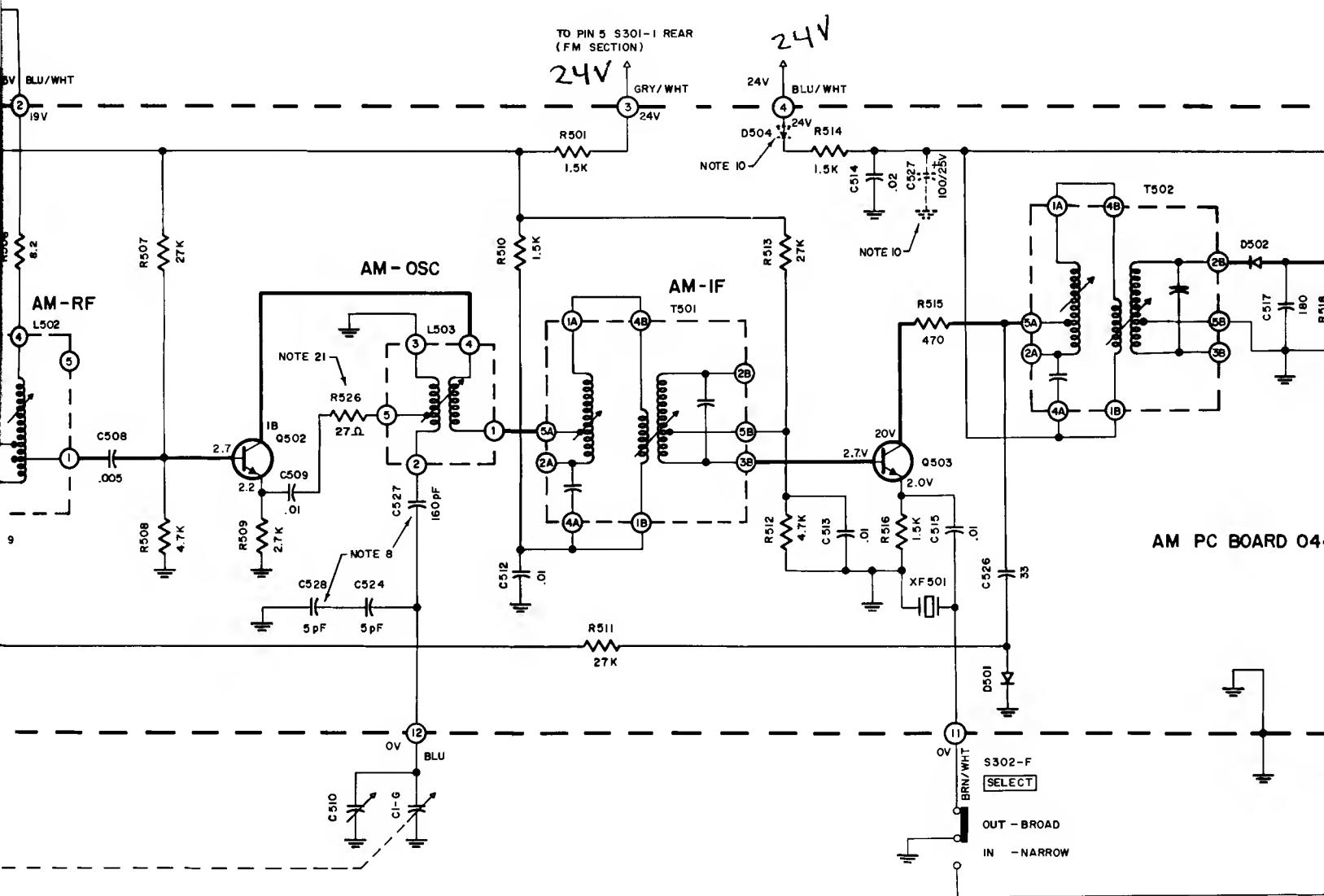


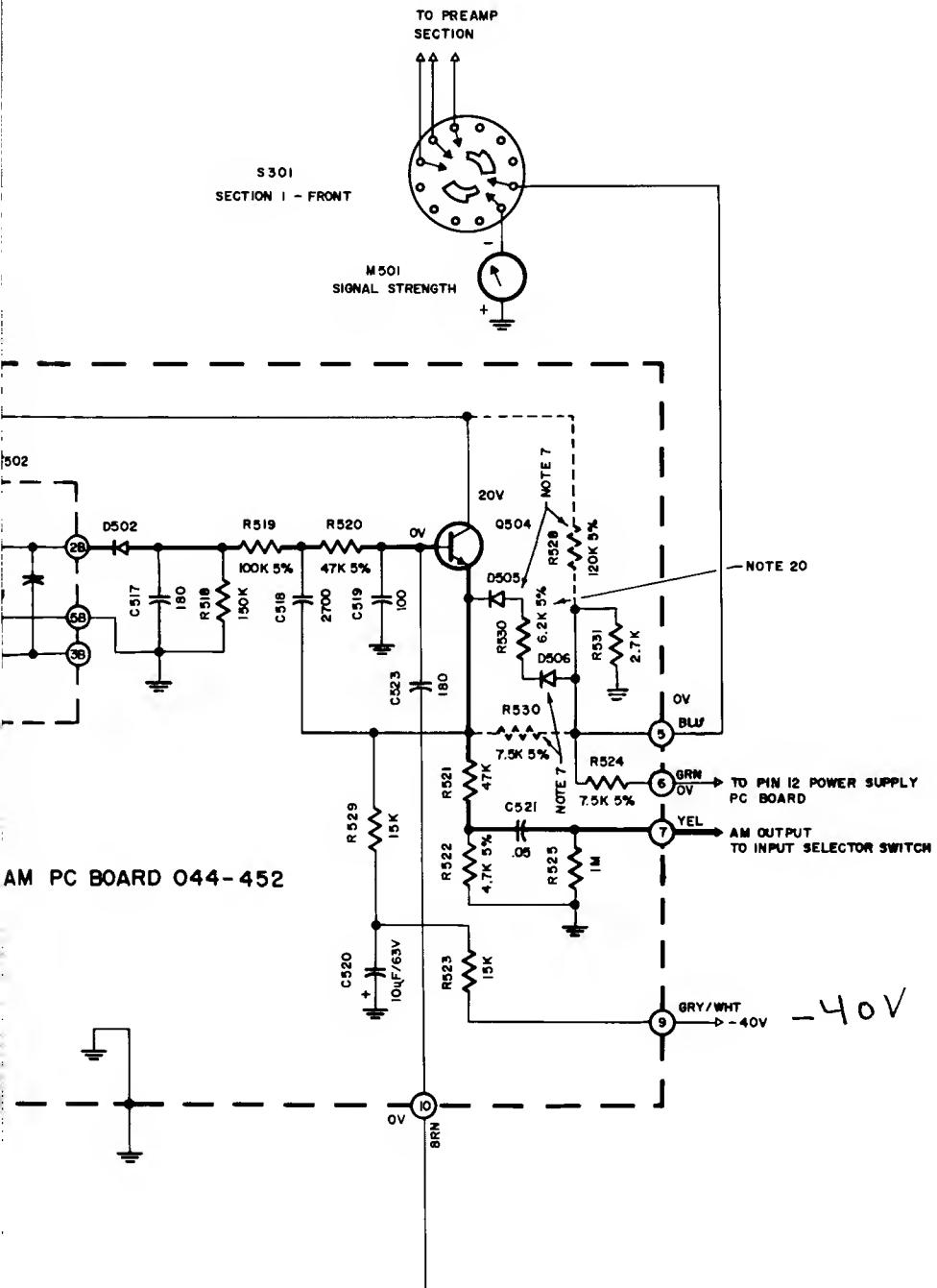
RIGHT CHANNEL PREAMP. PRINTED CIRCUIT BOARD 044-554



AM PC BOARD 044-452

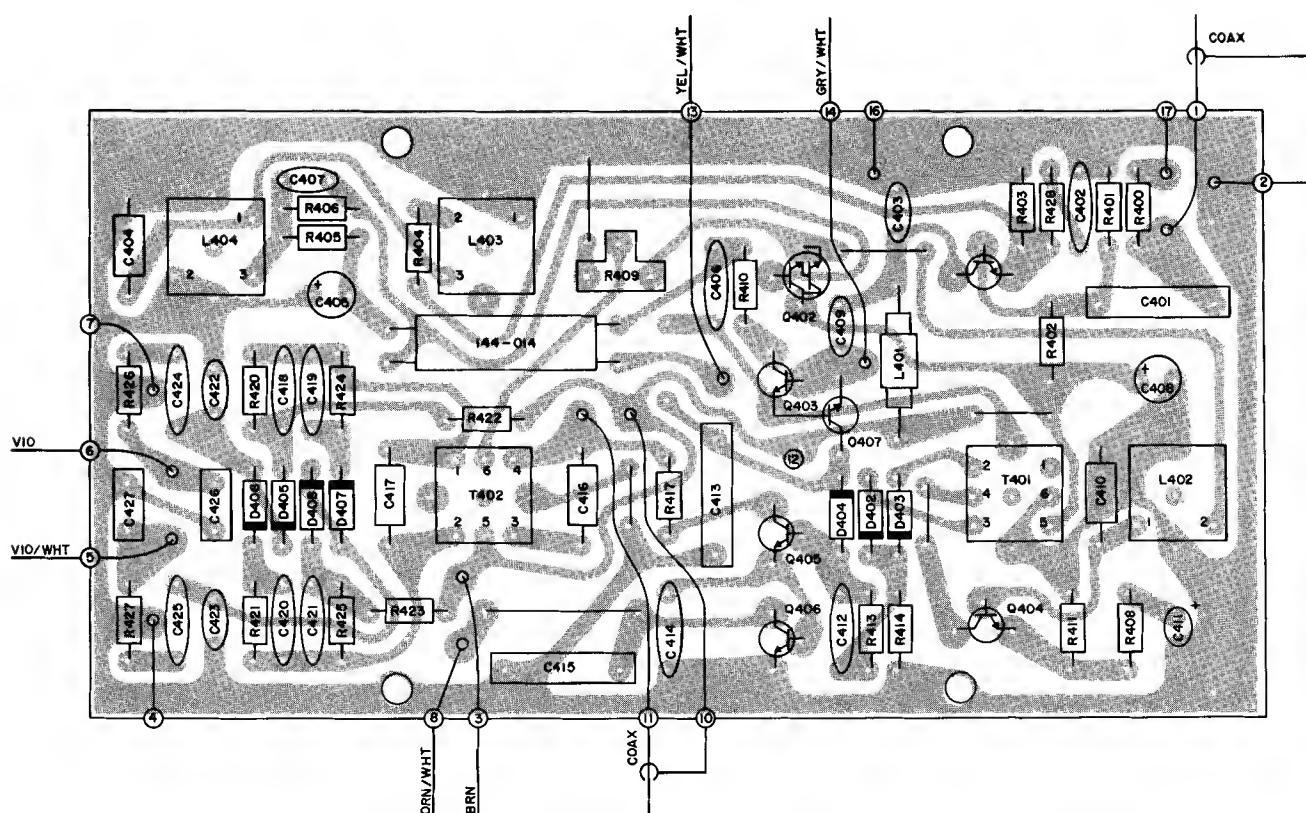


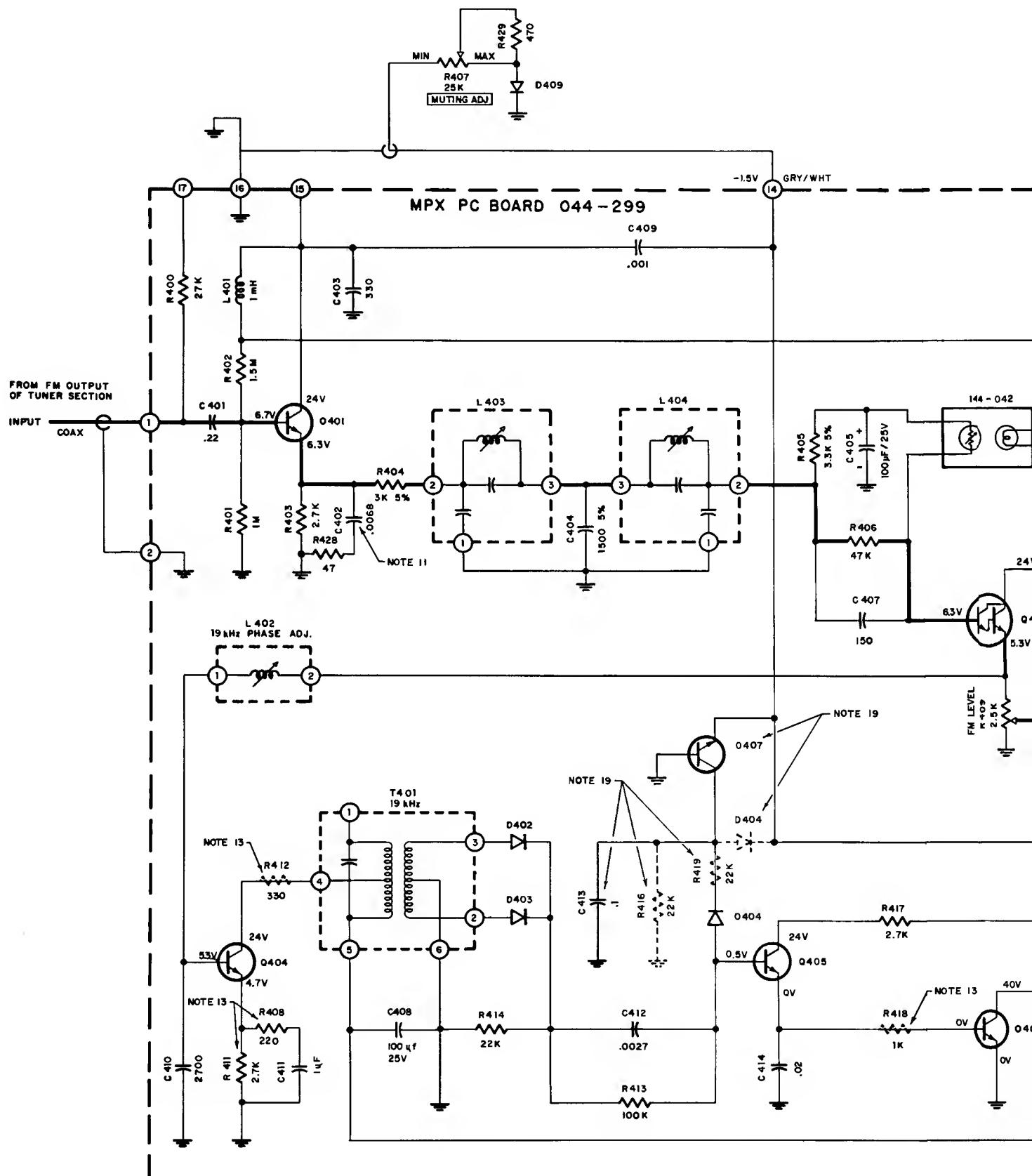




AM SECTION

MPX PC BOARD 044-299

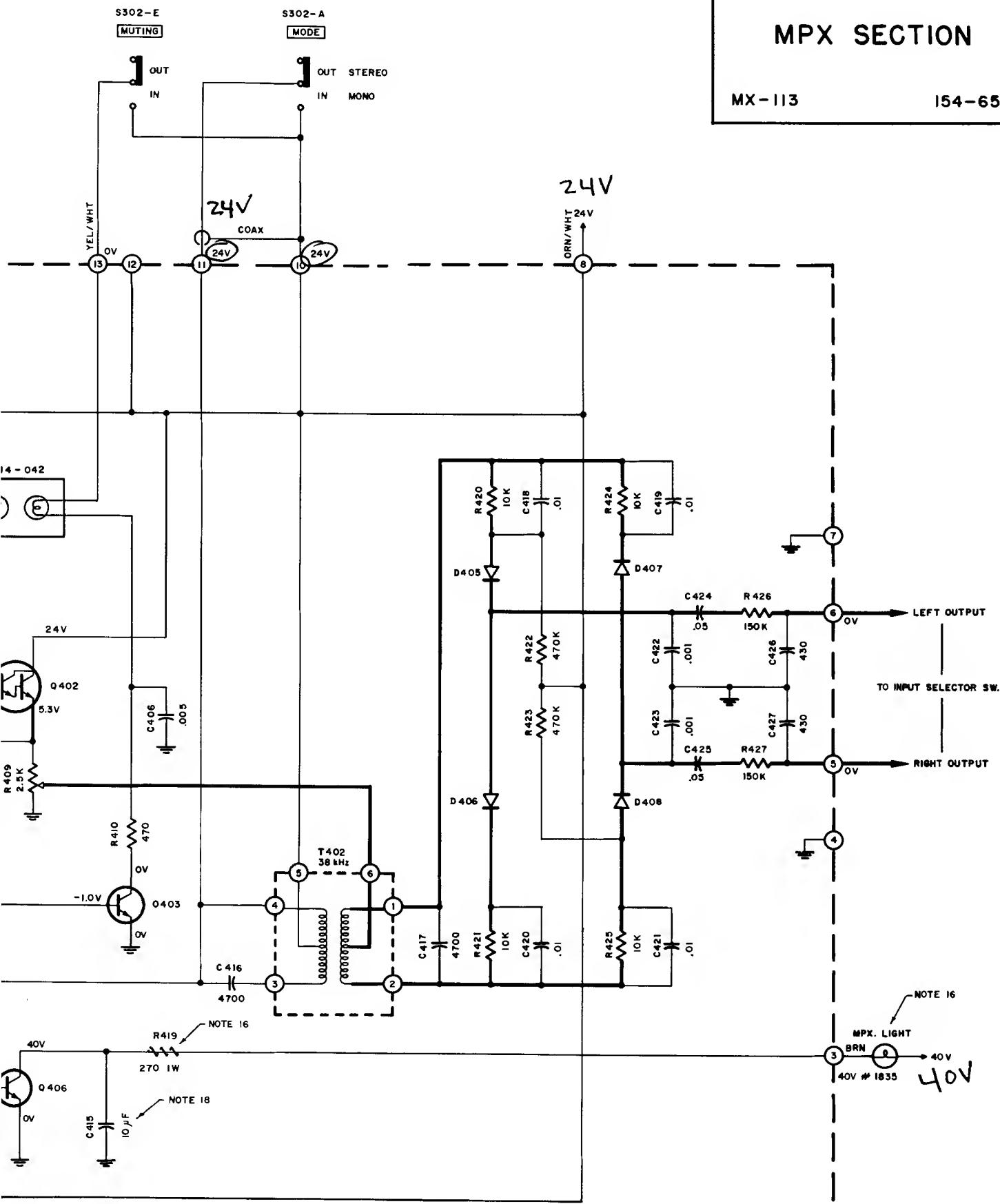




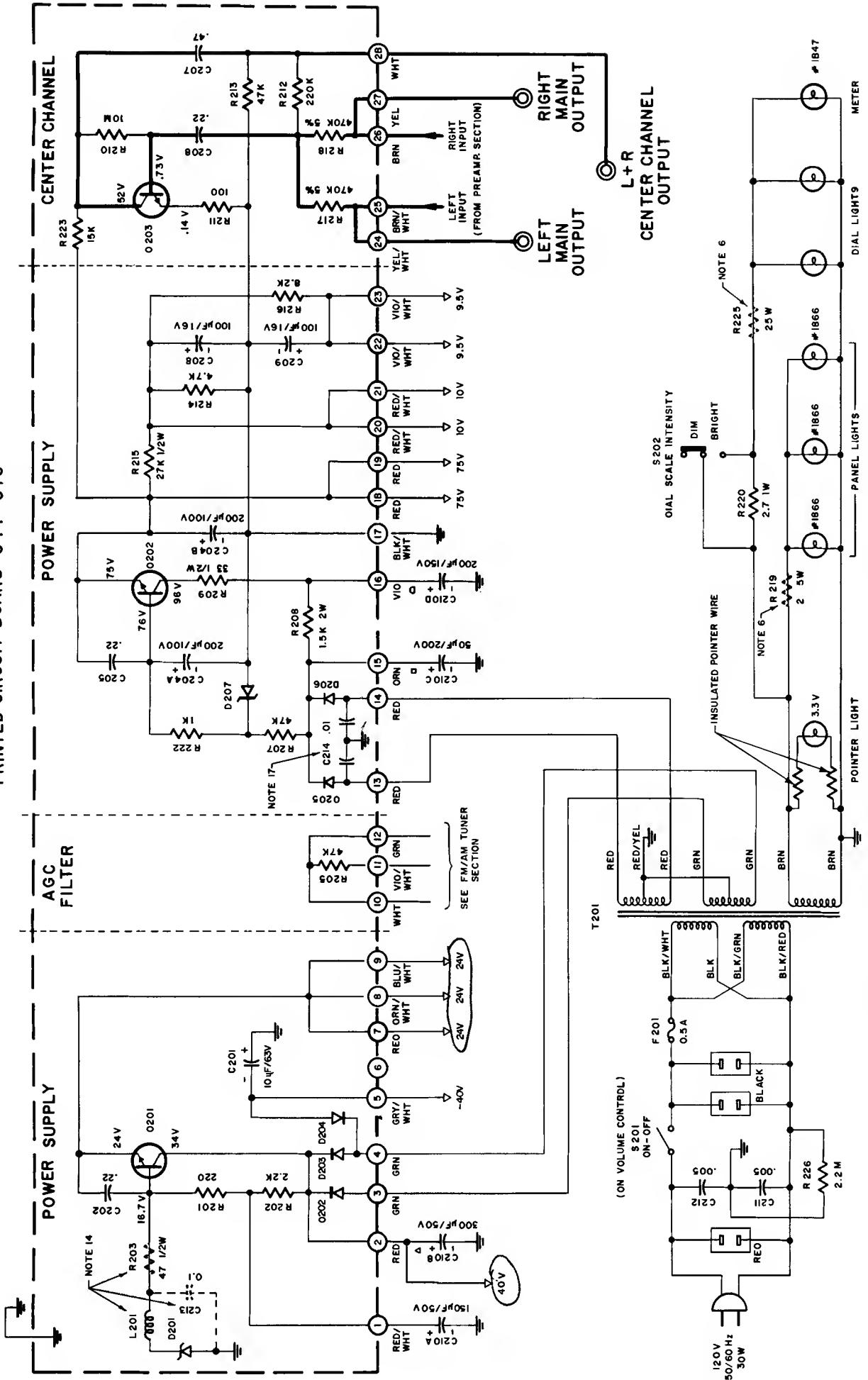
MPX SECTION

MX-113

154-650



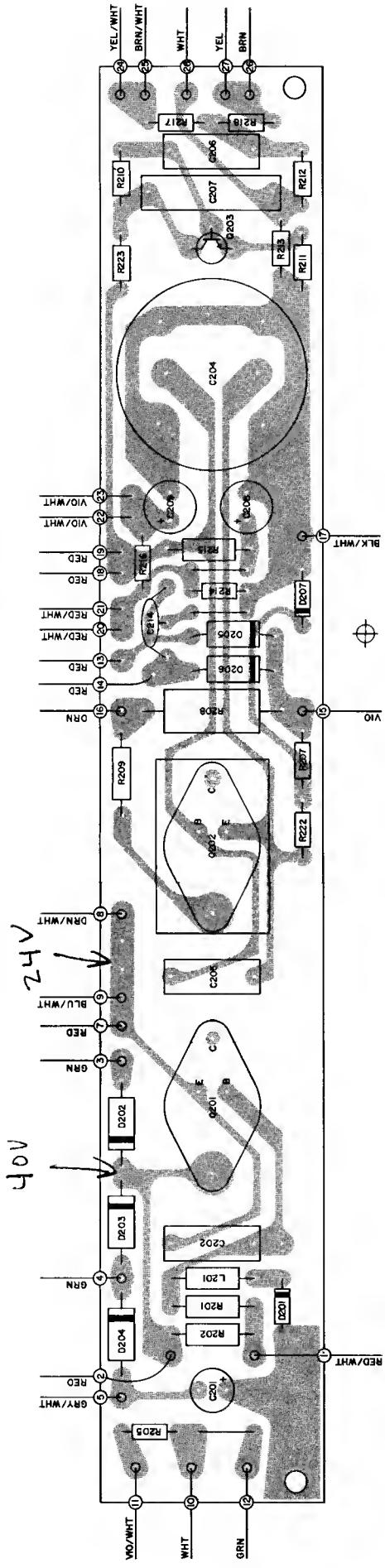
PRINTED CIRCUIT BOARD 044-576

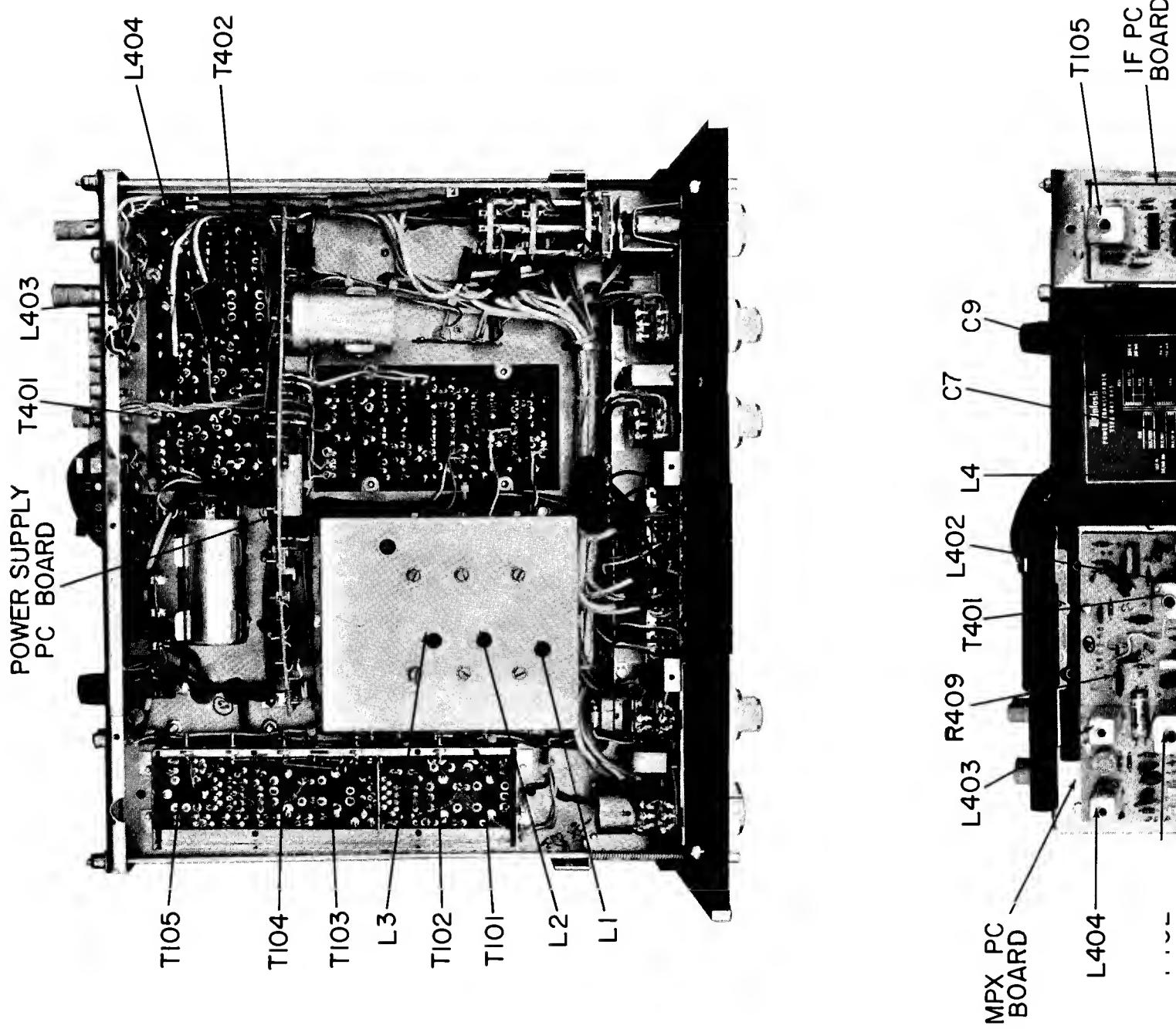


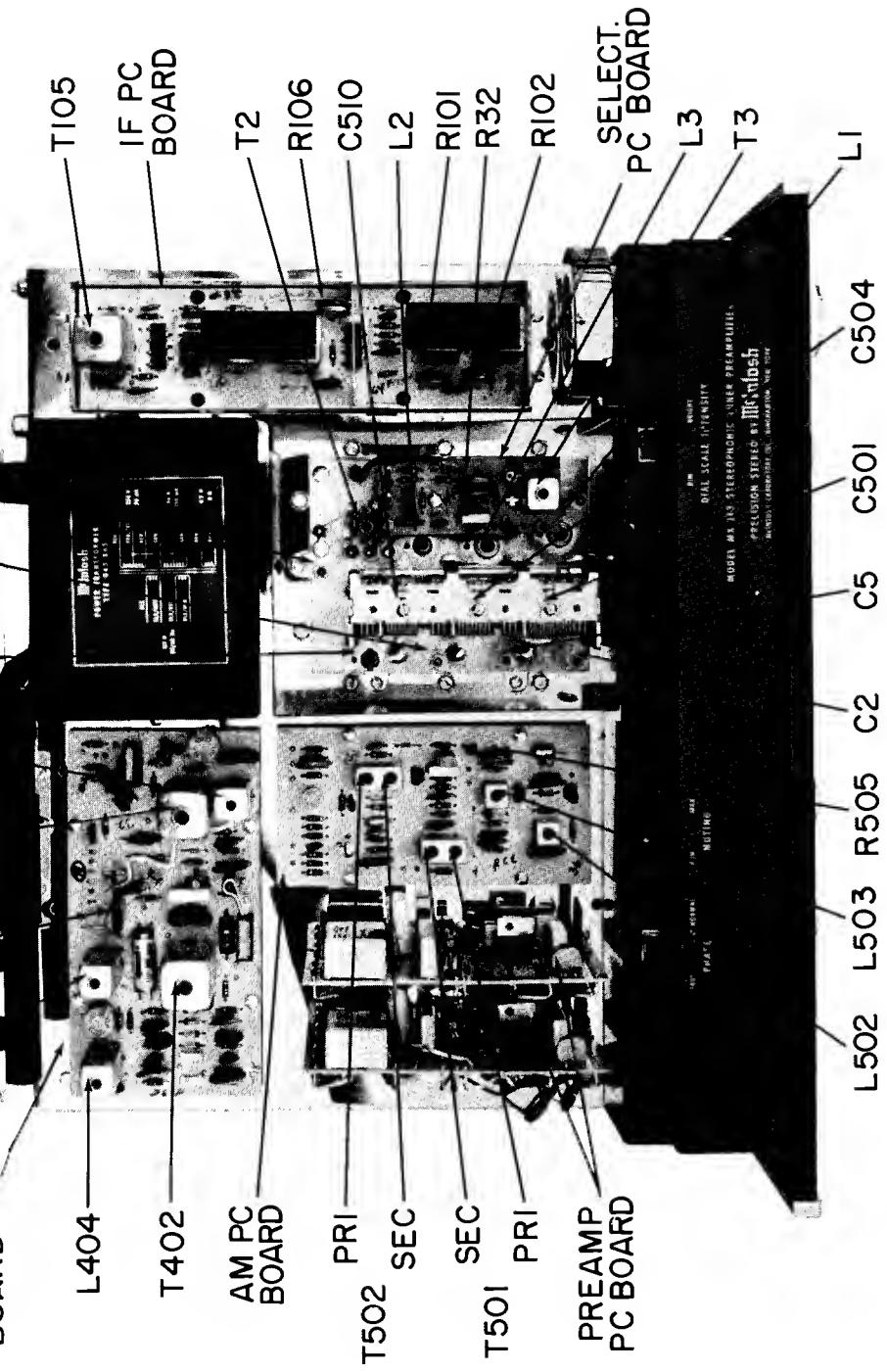
POWER SUPPLY / CENTER CHANNEL SECTION

MULTIPLEX DECODER ALIGNMENT

POWER SUPPLY/CENTER CHANNEL PC BOARD 044 - 576







MX 113 ALIGNMENT INSTRUCTIONS

All McIntosh tuners are carefully aligned and tested at the factory using the finest available test equipment. All McIntosh tuners will meet their published specifications when shipped from the factory.

After extensive operation, or servicing, it may be desirable to realign the tuner circuits for best performance. The charts below give complete information on the circuit realignment procedure for the MX 113.

The test equipment listed (or its equivalent) is necessary to properly align an MX 113. The accuracy of the alignment will be directly related to the accuracy and calibration of the test equipment used.

If the necessary test equipment is not available, alignment should not be attempted. For additional information, contact Customer Service Department, Mc Intosh Laboratory, Inc., 2 Chambers Street, Binghamton, New York 13903 (telephone 607-723-3512).

Alignment should be done in the following order: AM-FM-MPX.

TEST EQUIPMENT REQUIRED

1. AM Signal Generator (Measurement 65B or equivalent.)
2. FM Signal Generator (Measurement 188 or Sound Technology 1000A).
3. VTVM (RCA WV98C).
4. Multiplex Generator (Radiometer SNG1) or Sound Technology 1000A.
5. 10.7 MHz FM Sweep Generator (Kay 385 or equivalent.) (Not needed if Measurement 275 IF converter is available.)
6. 10.7 MHz Generator (preferably crystal controlled).
7. Oscilloscope (Hewlett-Packard 120B or equivalent).
8. Harmonic Distortion Analyzer (Hewlett-Packard 333A or equivalent).
9. 10.7 MHz \pm 75 kHz Sweep Marker Generator.

AM ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR	ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION				
1	Point of no interference or signal	455kHz	Through external capacitor to Pin 2 on AM circuit board	CW	Signal strength meter.	Normal	Pri. & Sec. cores of T501 & T502	As the tuner output increases, attenuate generator output to keep meter indication narrow 4. Selectivity switch remains in narrow position.
2		600kHz	Through a 200pF capacitor to ant. terminals.	Same	Same	L503 (oscillator coil.)	Same	Same as Step 1.
3	1400kHz	1400kHz	Same	Same	C510 (oscillator trimmer)	Same		Repeat Steps 2 & 3 until dial calibration is accurate.
4	600kHz	600kHz	Same	Same	L501 (AM antenna rod) & L502 (AM-RF)	Same		Same as Step 1 except adjust generator so that output signal is just above the noise level. Position antenna rod away from chassis and nearby objects.
5	1400kHz	1400kHz	Same	Same	C501 (AM antenna trimmer) & C504 (AM-RF trimmer).	Same		Repeat Steps 4 & 5 until output is as high as possible.
	1000kHz	1000kHz	Same	30% @ 400Hz	Distortion Analyzer	L or R tape output.		With a distortion analyzer, the following measurements can be performed:
								1. With a 1mV input signal adjust "AM Level" control for 0.35 volts of audio output at tape outputs. This will correspond to 1.2 volts audio output for a 100% modulated signal.
								2. With a 1mV input signal, harmonic distortion, whistle filter attenuation at 10kHz modulating frequency and signal to noise ratio may be measured.
								3. IHFM sensitivity of 75 microvolts for 20dB signal to noise ratio. (This measurement is only possible in the absence of man-made interference, as fluorescent lamps, etc.)

FM ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR	ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION				
	Point of no interference	10.7MHz	Through external capacitor to Q4 gate.	FM +200kHz sweep & 60Hz rate.	Oscilloscope	Top (Primary) & Bottom (Secondary) marker	Maximum height of 10.7MHz	Selectivity switch must be in the normal position. Turn muting off for alignment tests. Keep signal generator output low to prevent limiting.

	Point of no interference.	10.7MHz	Through external .01µF capacitor to Q4 gate.	FM +200kHz sweep, 60Hz rate.	Oscilloscope	TP1	Top (Primary) and Bottom (Secondary) of T2.	Selectivity switch must be in the normal position. Turn muting off for alignment tests. Keep signal generator output low to prevent limiting.
1							Top (Primary) and Bottom (Secondary) of T3.	Selectivity switch must be in the "select" position. All further test and alignment steps will be in "normal" position. Selectivity switch in "normal" position. Adjust R32 for equal height of markers in both positions of "select" switch.
2	Same	Same	Same	Same	Same	Same	Top and Bottom cores of IF filters.	The linear phase filters as employed in the IF do not have a flat-topped response. See typical response curve - Fig. 2. Do not stagger tune.
3	Same	Same	Same	C.W.	VTVM	TP2	Top (sec) core of T105.	Zero DC at TP2.
4	Same	Same	Same	Same	Pin 6 of T105	Bottom (Pri.) core of T105.	Maximum possible negative voltage.	If a distortion analyzer is available, omit this step. Adjust T105 (Pri.) after Step 6. At that time use a 1mV signal from an FM generator. Modulate 100% √ 400Hz. Adjust primary of T105 for minimum distortion. Should be less than 0.3%.
5	105MHz	105MHz	300Ω antenna terminals w/* matching network.	100% √ 400Hz	VTVM connected to TP1 and oscilloscope connected to L or R main output.	Oscillator trimmer C9.	Maximum negative voltage at TP1.	As TP1 voltage increases reduce output of signal generator to keep TP1 voltage as low as possible.
6	90MHz	90MHz	Same	Same	Same	Oscillator coil L4.	Same	Repeat steps 5 & 6 until dial calibration is accurate.
7	105MHz	105MHz	Same	Same	Same	Mixer RF2, RFI trimmers C7-5-2	Same	Same as step 5.
8	90MHz	90MHz	Same	Same	Same	Mixer RF2, RFI coils L3-2-1	Same	Same as step 5. Then repeat steps 7 & 8 until TP1 voltage is as high as possible for the least signal input at both alignment frequencies.
9	Same	Same	Same	Same	VTVM connected to TP1 and a harmonic distortion analyzer to L or R output.			This step is an overall sensitivity check. Reduce input signal to the point where total noise and distortion reads 3% (-30dB). The input signal will then be the usable sensitivity and should be less than 2.5µV.
10	Same	Same	Same	Same	R101,102, 106			With generator output at 200µV, adjust R106 for sensitivity meter reading of 6. With generator output at 100kµV, adjust R101 for full scale of sensitivity meter ("select" switch "Out"). Adjust R102 for full scale of sensitivity meter ("select" switch "In").

MULTIPLEX DECODER ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			TYPE	INDICATOR CONNECTED TO	ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION					
1	100MHz	100MHz	300Ω antenna terminals w/ approx. 1000 microvolts signal w/* matching network.	75kHz Deviation @ 67kHz	AC-VTVM	L or R output jack.	L403 and L404 (SCA adj.)	Minimum output @ L or R output jack.	Adjust for minimum output with 67kHz modulation.
	100MHz	100MHz	Same	19kHz stereo pilot.	AC-VTVM or oscilloscope w/very low cap. probe.	T401, Pin 2 or 3.	L402 (19kHz phase adj.) & T401 (19kHz doubler)	Adjust for maximum AC voltage.	Decrease pilot level, if necessary, so that 19kHz circuits do not limit or saturate.
2	Same	Same	Same	Same	AC-VTVM	T402, Pin 1 or 2.	T402 (Pri) & bottom (Sec) tuning slugs.	Adj. for maximum AC voltage.	Decrease pilot level so that 19kHz and 38kHz circuits do not limit. Mode switch must be in stereo position.
	Same	Same	Same	Same	1kHz (100% modulation) L or R only, pilot level normal and on.	L or R output jack.	T402, Bottom (Sec.) tuning slug.	Modulate left channel and measure right channel output. Adjust T402 bottom - tuning slug (Sec.) for minimum right channel output (maximum separation). Then, reverse channels and measure left channel separation. For this adjustment and measurement, no test lead should be connected to TP#2.	35dB separation or more.
4	Same	Same	Same	1kHz (100% modulation) L or R only, pilot on.	AC-VTVM	L or R output jack.	L402, Bottom (Sec.) tuning slug.	Less than 12mV of residual.	Adjust "FM-Level" control (R409) for 1.2 volts off audio output at fixed output jacks. Then, turn off the modulation and measure the residual of the 19kHz and 38kHz frequencies.
	100MHz	100MHz	Same	1kHz (100% modulation) L or R only, pilot on.	AC-VTVM	L or R output jack.			
5									

Note 1: If signal generator has other than 50 ohm internal impedance, use a resistor of 150 ohms less internal generator impedance.

FIG. 1 ANTENNA MATCHING NETWORK

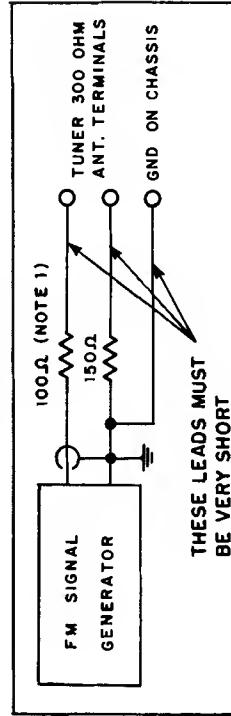
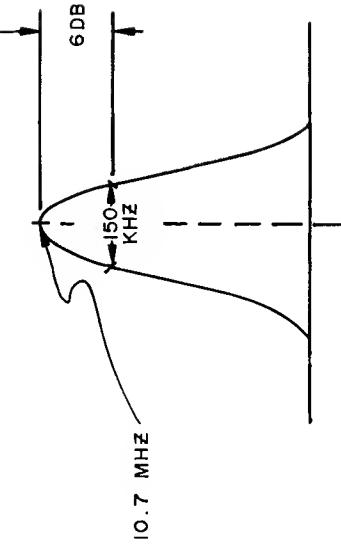


FIG. 2 TYPICAL IF RESPONSE CURVE



REPLACEMENT PARTS

All parts not listed are common items obtainable from radio parts jobbers.

Replacement parts may be obtained when ordered by PART NUMBER from:

McIntosh Laboratory, Inc.
Customer Service Department
2 Chambers Street
Binghamton, New York 13903
(Telephone 607-723-3512)

CAPACITORS

C109	Ta. Elect.	22μF	20V	066-148
C201	Elect.	10μF	50V	066-221
C204	Elect.	200/200μF	100V	066-159
C202	Mylar	.22μF	250V	064-068
C205,206	Mylar	.22μF	250V	064-068
C207	Mylar	.47μF	250V	064-069
C208,209	Elect.	100μF	16V	066-177
C210	Elect.	50/200/300/150μF	066-128	
		200/150/50/50V		
C301,302	Mylar	.47μF	250V	064-069
C305,306	Ta. Elect.	10μF	20V	066-149
C307,308	Ta. Elect.	10μF	20V	066-149
C315,316	Elect.	100μF	15V	066-226
C317,318	Mylar	.47μF	250V	064-069
C319,320	Mylar	.22μF	200V	064-087
C321,322	Polypropylene	.0068μF		064-103
C323,324	Mylar	.047μF	250V	064-066
C325,326	Mylar	.47μF	250V	064-069
C327	Mylar	.47μF	250V	064-069
C329,330	Mylar	.047μF	250V	064-066
C331,332	Mylar	.022μF	250V	064-065
C337,338	Mylar	.1μF	250V	064-067
C339,340	Mylar	.47μF	250V	064-069
C341,342	Mylar	.047μF	250V	064-066
C343,344	Mylar	.47μF	250V	064-069
C401	Mylar	.22μF	250V	064-068
C405	Elect.	100μF	25V	066-161
C408	Elect.	100μF	25V	066-161
C411	Ta. Elect.	1.0μF	35V	066-147
C415	Mylar	10μF	63V	064-178
C502	Polystyrene	4700pF		064-091
C503	Ta. Elect.	.47μF	35V	066-167
C507	Ta. Elect.	3.3μF	35V	066-170
C515	Polyester	.01μF		064-101
C518	Polystyrene	2700pF		064-093

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D1	Ge. signal diode	070-003
D2,3	Si. diode	070-047
D101,102	Si. diode	070-022
D103,104	Ge. signal diode	070-047
D105,106	Ge. signal diode	070-003
D107,108	Si. diode	070-022
D201	Zener diode 24V	070-049
D202,203	Si. diode	070-031
D204,205	Si. diode	070-031
D206	Si. diode	070-031
D207	Zener diode 75V	070-025
D402,403	Si. diode	070-047
D404	Si. diode	070-022
D405,406	Ge. signal diode	070-003
D407,408	Ge. signal diode	070-003
D409	Ge. signal diode	070-003
D501	Si. diode	070-022
D502,503	Ge. signal diode	070-003
D505	Si. diode	070-046
D506	Si. diode	070-047
CHOKES & COILS		
L1	1st RF coil	122-115
L2	2nd RF coil	122-114
L3	Mixer coil	122-113
L4	Oscillator coil	122-112
L101,102	Choke 75μH	122-013
L401	Choke 1MH	122-092
L402	Filter coil (19kHz)	122-094
L403,404	Filter coil (SCA)	122-093
L501	AM antenna	122-110
L502	AM RF coil	122-086
L503	AM oscillator coil	122-085
TRANSISTORS		
Q1,2	Si. M.O.S. F.E.T.	132-088
Q3	Si. NPN transistor	132-087
Q4	Si. Junction F.E.T.	132-097
Q5	Si. Junction F.E.T.	132-097
Q6	Si. M.O.S. F.E.T.	132-086
Q201 2N3054	Si. NPN transistor GE246	132-065
Q202	Si. NPN transistor	132-028
Q203	Si. NPN transistor	132-095
Q301,302	Si. PNP transistor	132-096
Q303,304	Si. PNP transistor	132-096
Q305,306	Si. NPN transistor	132-095

Q307
Q309
Q311
Q313
Q315
Q401
Q402
Q403
Q405
Q406
Q501
Q503
Q504
F201
R335
R356
R377
R378
R407
R219
R220
R225
S301
S302
S304
T1
T2
T3
T101
T102
T103
T104
T105
T201
T401

Q307,308	Si. NPN transistor	132-095	T402	FM RF transformer (38kHz)	162-054
Q309,310	Si. PNP transistor	132-096	T501,502	AM IF transformer	162-050
Q311,312	Si. NPN transistor	132-095		MODULES	
Q313,314	Si. NPN transistor	132-092		Tone control module	130-027
Q315,316	Si. NPN transistor	132-042		LDR network	144-042
Q401	Si. NPN transistor	132-092		METERS	
Q402	Si. NPN transistor	132-090	M501	Tuning meter	124-005
Q403,404	Si. NPN transistor	132-092		INTEGRATED CIRCUIT	
Q405	Si. NPN transistor	132-092	IC101,102	Integrated circuit	133-002
Q406	Si. NPN transistor	132-042		FILTERS	
Q501,502	Si. NPN transistor	132-082	FN1	FM filter	180-009
Q503	Si. NPN transistor	132-082	XF501	AM filter	180-010
Q504	Si. NPN transistor	132-090		LAMPS	
	FUSES			#1847 (Meter)	058-008
F201	Fuse .5A slo-blo	089-020		#1866 (Front panel)	058-014
	POTENTIOMETERS			#1835 (MPX)	058-037
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R356	Loudness/Balance control	134-236		FRONT PANEL & TRIM	
R377	Bass control	134-203		Front panel	044-273
R378	Treble control	134-203		Front panel end caps	018-120
R407	Muting control	134-216		Volume knob	044-372
	RESISTORS			Input selector knob	044-372
R219	Wirewound 2Ω 5W	139-005		Tuning knob	043-272
R220	Wirewound 2.7Ω 1W	139-002		Bass knob (rear)	090-009
R225	Wirewound 2Ω 5W	139-005		Bass knob (front)	044-374
	SWITCHES			Treble knob (rear)	090-009
S301	Input selector switch	146-125		Treble knob (front)	044-374
S302	Mode selector switch	150-004		Loudness knob	044-374
S304	Loudness/Balance control	134-236		Balance knob	090-009
	TRANSFORMERS			Level set knob	090-010
T1	Balun	043-226		Pushbutton	090-105
T2	FM IF transformer	162-059		MOUNTING SYSTEM	
T3	FM IF transformer	162-042		Shelf bracket (right)	043-622
T101	FM IF filter input	162-053		Shelf bracket (left)	043-623
T102	FM IF filter output	162-052		Mounting template #100	038-179
T103	FM IF filter input	162-053		Hardware package	043-446
T104	FM IF filter output	162-052		MISCELLANEOUS ITEMS	
T105	FM discriminator	162-036		Plastic feet	017-041
T201	Power transformer	043-865		Tuning shaft	021-067
T401	FM RF transformer (19kHz)	162-055		Shipping carton	044-337
				Push terminal (antenna)	074-032

Owners manual	038-667
Dial cord	044-226
Dial pointer	043-876
Shorting plug	127-021
AC line cord	170-021
FM dipole antenna	170-033
Fuseholder	178-001
Dial glass (note 8)	

SERVICE BULLETIN

REDUCE RF INTERFERENCE

MODEL: MX 113 AM/FM Tuner-Preamp

PURPOSE OF MODIFICATION: To reduce sensitivity to RF-interference.

WHAT UNITS ARE AFFECTED: All units with Serial Numbers below 400H1

WHEN MODIFICATION SHOULD BE MADE: Whenever a customer complains of undesired reception of CB and HAM- apparatus, when the unit is operating in the Phono Mode- Also when interference from man-made noise is encountered, such as: Refrigerators, passing cars, etc.

PARTS REQUIRED:

QUANTITY	PART NUMBER	DESCRIPTION
2	136301	Res. = 100K, 1/4W, 10% R399, 400
2	061002	Disc. Cap. = 1.8pF, ±.25pF NPO
2	061008	Disc. Cap. = 6.8pF, 20% NPO
2	061032	Disc. Cap. = 470pF, 20%
2	136296	Res. = 1K, 1/4W, 10%

PROCEDURE: This change has to be made on both left and right PC board 043091 and 043092.

1. Discard: C302, 304 = 061010 = Disc. Cap. 12pF
C313, 314 = 061009 = Disc. Cap. 10pF
R399, 400 = 136303 = Comp. Res. 1M

2. Connect a 061032 = 470pF capacitor between the base and the emitter of transistor Q301, 302.

(OVER)

3. Connect a 061002 = 1.8pF capacitor from the collector of transistor Q301, 302 to the collector of transistor Q305, 306.
4. Connect a 061008 = 6.8pF capacitor from the base of transistor Q307, 308 to the collector of transistor Q307, 308.
5. Replace R399 (R400) with a 136301 = 100K resistor.
6. Add a 1000 ohm resistor (136296) in series with the orange lead that connects to pin #10 on the left preamp board. This resistor should connect directly to pin #10 and the end of the orange lead. Using leads no longer than necessary, do the same for the orange/white lead connecting to pin #7 on the right preamp board.

